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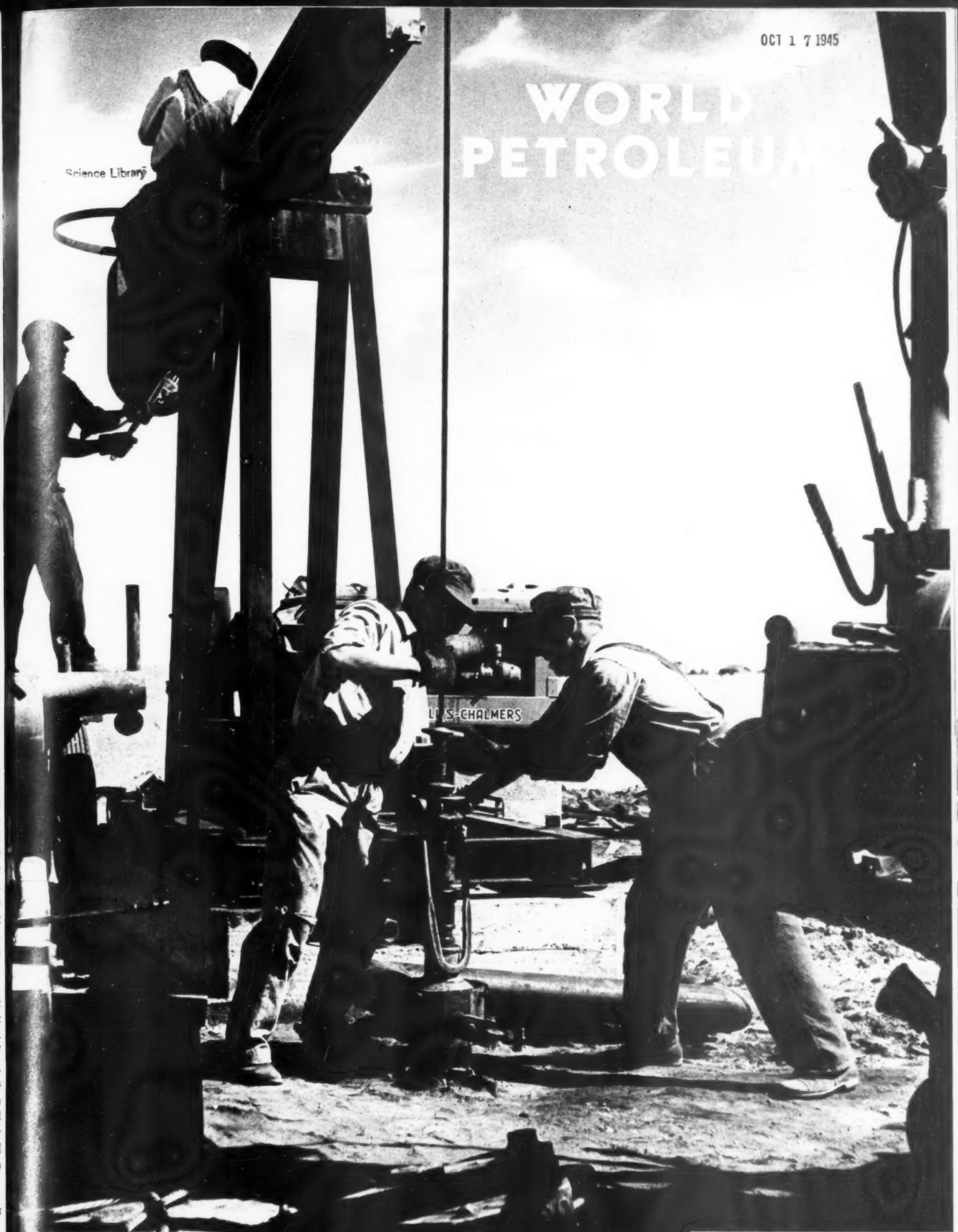


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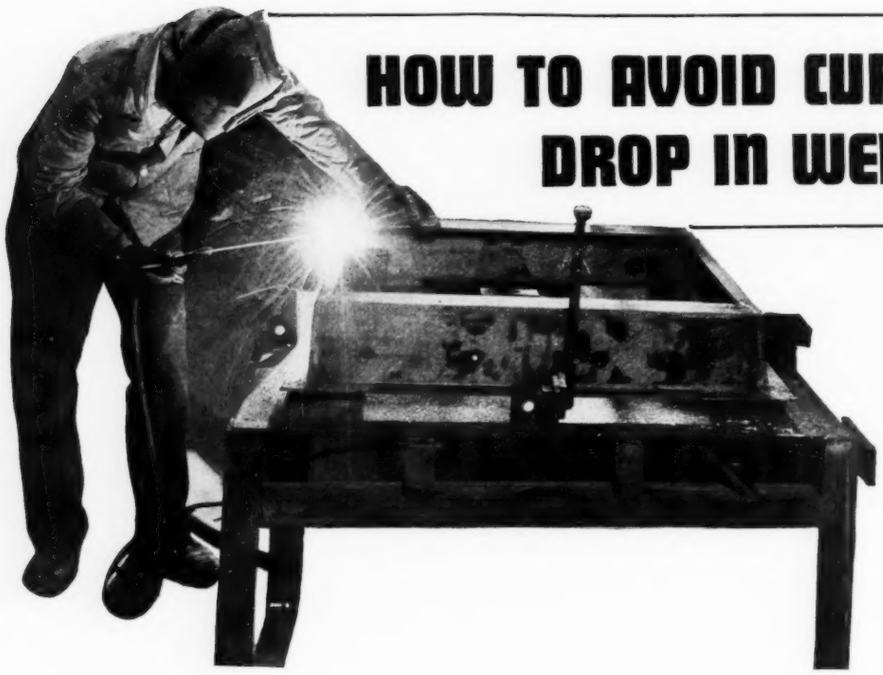

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# WORLD PETROLEUM

PUBLISHED BY MONA PALMER

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

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# EDITORIAL

## SPEED OF DECONTROL AIDS OIL READJUSTMENT

MOST encouraging to the early outlook for the oil industry has been the speedy removal since V-J Day of restrictions under which it has been compelled to operate for almost four years. The abrogation of gasoline rationing virtually from the hour when the Japanese surrender became a certainty came with a suddenness that was almost stunning to purchasers and purveyors alike. It has been followed day by day by the relaxation or removal of limitations upon the use of materials and of regulations governing well spacing, pooling of products and other rules applying to petroleum operations that had been in effect so long that they had come to seem like normal guides to the conduct of the business.

This prompt action by the Office of Petroleum Administration and by other governmental agencies in discontinuing most of the controls that have been in effect during the war will be extremely helpful in enabling the industry to readjust itself to the changed conditions of peacetime with the minimum of loss and disturbance. One of the most necessary steps in this readjustment is to reduce the output of fields that have been producing above their maximum efficient rate and to prevent the waste that attends production far in excess of current market demand. While figures of proposed production for the month of September were issued by Washington in accordance with the practice that has been followed throughout the war these were no more than suggestions and state regulatory bodies have promptly resumed their former freedom of action in departing from them to the extent that seemed to be in the public interest.

The Texas Railroad Commission which has come to be looked to for leadership in measures of conservation acted quickly and boldly by reducing the allowable for wells in that state by 395,588 barrels for the month instead of the 212,000 barrels included in the PAW forecast. By so doing it eased the strain upon East Texas and other fields that were being injured by the excessive rate of production that had been imposed to meet heavy war demands. At the same time its action will help to avoid the accumulation of excess above-ground stocks with the injurious effect upon industry operations which repeatedly have been demonstrated in the past. Since the daily output of Texas wells had been raised by 822,000 barrels or 80 percent of the whole wartime increase the course adopted there will have a more pronounced effect than any action that can be taken elsewhere, but the example set by the Texas Commission is one that may well be followed by other state regulatory bodies.

Termination of some of the other orders that have been in effect during the period of military activity raises issues that call for action by state commissions or legislatures of the oil producing states. One of these is the regulation governing well spacing. The limitation of one well to forty acres was adopted as a means of conserving materials but experience during the past four years has demonstrated its desirability for many of the country's fields. With the lapsing of the rule pressure is being exerted in various districts to reduce spacing limits to ten acres or to some figure in that vicinity. A new argument against narrow spacing in addition to its recognized effect in shortening the life of a field is found in the fact that in most areas deeper drilling is necessary now in order to find production. Consequently, the cost of each well is increased and the pay-out period is lengthened so that drilling becomes unprofitable at current price levels unless fairly broad spacing requirements are adopted.

The speed with which reconversion is proceeding in industries that provide the market for petroleum products also brightens the outlook by promising an earlier improvement in civilian demand than had been anticipated. Automobile assembly lines are beginning to turn out cars in substantial numbers and manufacturers have raised their estimates of production for the coming year by as much as two million vehicles. Reports of the existence of substantial stocks of natural rubber in the reoccupied areas of the Far East have led to assurances that tires will cease to be a bottleneck in the return of motor vehicles to the country's highways. Earlier estimates that four to five years would elapse before passengar car registration would rise to the pre-war level are being shortened to predictions that this stage will be reached by 1947. So far as the United States is concerned it appears that the period of sub-normal demand for petroleum products as compared with pre-war years will be less prolonged than has been generally anticipated.

Most reassuring to the industry is the evident intention to dissolve the authority which the federal government perforce has exercised during the war period and to permit a return to the freedom of competition that existed before the Axis holocaust was loosed upon the world. Release from these restrictions had been promised repeatedly and the expedition with which the promise is being carried out by Deputy Davies with the approval and support of Secretary Ickes testifies to the sincerity of their past assertions and promises to be the crowning achievement upon the efficient and successful teamwork between the oil industry and the government that has prevailed throughout the national emergency.

# PAW MOVES SWIFTLY IN LIFTING GOVERNMENT OIL CONTROLS

*WASHINGTON*

IN line with the oft-repeated assurances of Administrator Ickes and his deputy Ralph K. Davies, Petroleum Administration for War promptly began liquidating its control over the industry as soon as V-J Day became a certainty. Davies gave it as his "guess" that "we can wind up all the barbed wire" by the end of the year. Beginning with the immediate abandonment of gasoline rationing, many of the war-time restrictions and regulations have been cancelled, but others involving merged operations of one kind or another will take time to wind up.

PAW is proceeding in a manner calculated to accomplish a smooth and efficient transition. In the case of the oil industry, as has been pointed out by the Deputy Administrator, there is no reconversion required in the usual sense of the word.

"Various production, refining and distribution adjustments, Davies said, "must be made now that unit operation of the industry ceases to be necessary. But, in general, the same kinds of products are being produced today as are required in peacetime; the change lies principally in the direction of contraction and rearrangement. The oil industry enters the peace period in healthy condition and excellently equipped to assume overnight its peacetime role."

Among the first controls to come off were virtually all restrictive orders administered by PAW's Refining Division. For many of them the effective date of lifting was August 15, but other controls were continued for a 30-day period to permit refineries to complete certain contracts. Various forms, submission of which is required by PAW order, were continued for a two-month period to complete the records and allow final settlement of contracts.

In cancelling the controls, Davies expressed to the refining industry appreciation of its cooperation in the war program. "The Petroleum Administration for War", he said, "wishes to express to the refining industry keen appreciation of its splendid cooperation and wholehearted effort throughout the war. Industry has indeed distinguished itself in the service of the nation."

PAW also recommended termination of all military contracts for 100-octane aviation gasoline, with a provision for a tapering-off period not to exceed 30 days. Stockpiles of 100-octane were considered adequate to cover military requirements for several months.

In announcing this action, Davies revealed for the first time that production of 100-octane gasoline toward the close of the war had reached a level of 600,000 barrels a day from all United Nations plants, of which 525,000 barrels a day were produced in the United States alone. Although complete records for the peak period of 100-octane production, which occurred just before the cutback announced in July of this year, are not available, it is expected the figure for the United States may reach 530,000 barrels a day, Davies said.

This represents an increase of approximately 750 percent since Pearl Harbor, when the worldwide production available to what are now the United Nations was less than 80,000 barrels a day, of which about 58,000 were produced in the United States.

Since PAW took over the aviation gasoline program five months before Pearl Harbor, 360,000,000 barrels of this vital fluid have been produced. To do this a construction program nearly 95 percent completed before the end of the war and aggregating roundly $1,000,000,000 was undertaken under the supervision of PAW. This involved building added facilities in many foreign countries.

In recommending cancellation of the contracts, Davies explained that blenders of 100-octane and manufacturers of components used in the blending processes had been advised that their present stocks would be purchased by the government.

Termination of the 100-octane program will make available adequate supplies for refiners to return to pre-war schedules for making various grades of civilian gasoline. All refiners, Davies points out, will now have adequate supplies also for upgrading gasoline for civilian use to pre-war standards.

With the completion of the 100-octane program, which since June 1941 has been under the supervision of PAW with RFC acting as purchasing agent for the Army and Navy, procurement is returned to the military.

Effective September 30, PAW terminated its Aviation Reimbursement Plan, which as part of the war program protected refineries engaged in manufacture of aviation gasoline and its components against financial loss in the event of changes in specifications or extraordinary operations requested or approved by PAW. Davies explained: "This new action merely sets a deadline on claims for reimbursement for financial loss incurred through participation in the aviation gasoline program, but does not prejudice claims filed after that date for operations prior thereto."

The cut in military demands for petroleum products, Davies believes will be balanced to a large extent by the increased civilian requirements such as gasoline and home heating oil. The remaining net decrease in demand will be largely offset by decreases in dispensable supply operation. These supply reductions include elimination of crude production at higher than efficient rates and the discontinuance of subsidized operations, including curtailing of operations in the Elk Hills Naval Reserve, stopping movement of West Texas crude to California and similar war-time expedients.

Some marginal plants, many of which were idle before the war, and some operated for the RFC may shut down altogether for one reason or another. Most of the additional facilities that made possible the 25 percent increase in operations were in the form of additions to already existing plants and the Deputy Administrator believes they will be retained for the most part in post-war company programs.

For example, approximately $835,000,000 was expended on facilities in the United States for the 100-octane program since Pearl Harbor, but more than $600,000,000, or nearly 75 percent, was spent by private industry on facilities expected to be of permanent value. Of the remaining facilities, costing less than $235,000,000 it is expected that some will be continued in operation on rental or outright purchase agreements now being negotiated by the owning agency, RFC.

As for the labor front, it would seem that the cutbacks in military contracts for products will cause no "measurable" unemployment in the industry. Cancellation of the contracts for war products in specialized plants will cause some localized layoff, but the industry as a whole, after absorbing all its returning war veterans, is expected still to need additional personnel.

"With the return of the men and women serving with the armed forces, the oil operators will be able to return to their regularly scheduled work weeks and operate with normal complements instead of the limited staffs available for the past four years," Davies points out.

"Hundreds of thousands of dollars' worth of maintenance work, cut to the minimum during the war because of lack of manpower, will have to be undertaken to bring plants to pre-war efficiency. Marketing and distribution staffs will have to be rebuilt.

"On the whole, the petroleum industry looks forward not only to welcoming back the men and women who have played their part so well during the war period but to needed additional personnel despite cutbacks in military needs during the reconversion period."

As of September 1, PAW controls on well spacing and on construction in the production, natural gasoline, refining, and transportation branches of the industry went by the board. Three war-time materials and construction orders and their supplements were revoked: PAO-15, governing transportation and refinery construction; and PAO-9 and PAO-11, governing oil, gas and condensate well spacing, special production operations, and natural gasoline plant construction.

Thus, it is no longer necessary for operators to obtain permission from PAW to construct pipelines, gasoline plants and refineries, or to follow well-spacing patterns established by PAW.

Davies expects that as a result of its wartime experience the industry as a whole will look with more favor on the practice of following orderly and appropriate well-spacing plans. The orderly development of oil fields, he says, loses none of its importance by virtue of the cessation of hostilities. With PAW out of the picture, the matter is up to the state regulatory bodies.

At the same time controls were lifted, the War Production Board cancelled out its special inventory controls applicable to the petroleum industry, Order P-98-c, leaving the industry governed by the general inventory restrictions of WPB. Priorities assistance available under P-98-b remained in effect till September 30 to assure the industry a supply of needed materials at all times, even though the uses of material no longer were regulated by PAW.

RFC has curtailed, and promises "early termination "of subsidy payments on the transportation of crude and products. These payments were to maintain ceiling prices for petroleum along the eastern seaboard area, normally supplied by tankers from the Gulf Coast. Submarine sinkings and the requisitioning of all available tankers by the military required oil companies to use rail, barge and pipe lines at higher cost.

RFC took this action in the expectation that a sufficient number of tankers can now be returned to civilian use to put the industry back on a normal transportation basis. On September 1, RFC started, for a limited period, to pay transportation subsidies only for exceptional movements certified as essential by PAW.

In almost the same breath, RFC cut the tariff on crude and products moving through the Big Inch and the Little Big Inch to a rate "equivalent to current war shipping tanker rates", effective September 1st. Reason given was termination of the transportation subsidy. In announcing the reduction, RFC revealed:

"Through August 1945, the 'Big Inch' line since commencement of operations in February, 1943, has transported to the eastern seaboard area approximately 260,750,000 barrels of crude oil (of which approximately 46,000,000 barrels were delivered through Norris City, Illinois, and balance at Philadelphia and New York) and the 'Little Big Inch' since commencement of operations in March, 1944, has transported to the eastern seaboard approximately 107,125,000 barrels of petroleum products at a saving to government of millions of dollars over the cost by the more expensive tank car, barge and other abnormal methods of movement."

Wartime restrictions on the shipment of petroleum and products on inland waterways, including the Great Lakes, were lifted by the Office of Defense Transportation as of August 20. The revoked regulations, General Order ODT 19, governed the movements of inland vessels and specified various loading and unloading requirements under a permit system. According to Lawrence C. Turner, director of ODT's Waterways Department: "By eliminating cross hauls it (ODT 19) enabled the inland waterways to transport the greatest load of petroleum and its products in history approximately 1,730,000,000 barrels, including bunker fuel, at a critical time when railroads and other mediums of transportation could not possibly have carried the whole burden."

In a move to reestablish normal competitive marketing practices, PAW rescinded virtually all of its restrictions on the sale and purchase of petroleum products, administered by its Distribution and Marketing Division. Among the most important of the orders terminated was PDO 13 restricting the use of fuel oil in new and reinstalled facilities. Consumers now can order supplies from their local dealer just as before the war.

Also, the ban on credit cards at retail outlets has been removed. Military and farm consumers' preference in motor fuel deliveries has been abolished, and restrictions on the use of road oil have been lifted.

Rescinded also are a number of controls over supply and transportation of products. Among these is PAO-5 which prohibited shipments into the East Coast states (PAW's District 1) by rail or inland and intercoastal waterways unless scheduled by PAW or given special permission. Oil companies now are free to ship their products to the East Coast. But under Directive 59 PAW continues to schedule shipments to the East from the Midwest and Southwest (PAW's Districts 2 and 3) and to apportion the imports among original suppliers. These scheduled shipments will be in addition to those made independently by individual oil companies as a result of revocation of PAO-5. Directive 59 is slated to remain in effect until a sufficient number of tankers are available to supply the eastern seaboard.

Gone also is PAW's Facility Security Division whose job it was to prevent interruption in petroleum operations by sabotage or by fires, explosions or other accidents. As a final service to the industry, the division will send oil companies a description of a number of unusual safety ideas and devices that have been found in use in oil facilities in all sections of the country.

One problem that PAW has handed back to state regulatory authorities is the adjustment of production to meet peacetime market demand and conservation requirements. The Texas Railroad Commission acted promptly to resume state control of crude oil production as Washington relaxed its direction of the industry's activities. Cutting 395,588 barrels daily from September producing schedules in Texas the Commission pointed out that the state had increased its production 800,000 barrels daily since Pearl Harbor and that in peacetime the lack of military demand and loss in motor vehicle registrations will force production down to prewar levels.

Col. Ernest O. Thompson issued a characteristic statement in which he said: "By this aggressive action Texas is again assuming her sovereign right as a state to control the production of oil within her own borders. During the war we took orders from PAW as good soldiers but now that the war is over we resume our duties under Texas laws.'

The cut required by Texas is more than the September decline in crude demand for the entire nation as forecast by the U. S. Bureau of Mines. The Bureau suggested a domestic production of 4,572,000 barrels daily for September, a drop of 328,000 barrels daily under August.

An early result of relaxation of transportation controls was Atlantic Refining Company's action in reversing flow in the Keystone Pipeline extending from Philadelphia to Pittsburgh. Before the war this line carried refined products westward. Due to the emergency it was used to bring western crude to the east. Other line changes will be made soon, by companies whose normal peacetime operations were disrupted by war.

Temporary leases of Defense Plant Corporation owned refinery units have been negotiated by operating companies pending final purchase or long-term lease negotiations. Continental Oil Company has a 90-day lease on the big 100-octane plant at Ponca City, Oklahoma, and Humble Oil & Refining Company has leased the Baytown Ordnance Works where Humble has been synthetically producing 70 million gallons of toluene annually. This was the first synthetic toluene plant built and was in production 47 days before Pearl Harbor. Humble will use the plant to produce commercial solvents.

# EMERGENCY PIPE LINES POSE INDUSTRY PROBLEM

**By Ruth Sheldon**

SOME 625,000 tons of steel which were used to perform one of the most spectacular single tasks contributing to victory in the war just ended have now become 625,000 tons of headache to industry and government. The problem is, what is to be done with the "Big Inch" pipeline systems?

These noble Frankensteins which have delivered more than 375,000,000 barrels of crude and products to the East Coast since February, 1943, pose as potent a group of postwar questions as faces any industry.

Is the government going to continue to operate or lease the lines, thereby remaining in business? Should the lines continue to be used to transport crude and products? What would be the effect on the economies of the various parts of the country? Should they be used to transport natural gas? What is involved in peacetime competition between the lines and our increased tanker fleet? Should industry buy the lines? Should the lines be sealed up and reserved for national defense? How can the best interests of the public be served in the disposition of the lines?

These and many other detailed questions are the present topic of heated discussion in and out of industry. Although under existing law the Defense Plant Corporation and Defense Supplies Corporation have the authority to own and operate the "Big Inch" systems and other government owned pipelines until January 22, 1947, it is apparent that their fate must be decided upon long before that date in order to permit industry to go ahead with its peacetime reconversion and expansion plans on a secure basis.

When the O'Mahoney Senate Committee Investigating Petroleum Resources reconvenes this month in Washington the problem will be officially examined. Under the able leadership of W. Alton Jones, president of Cities Service Oil Company and president of War Emergency Pipelines, Inc., the joint industry company operating the lines, industry is preparing a factual presentation to be made to the committee which will include a discussion of the accomplishments of these war giants, their possible peacetime uses and the effect of those uses on the nation's and industry's economies.

It is likely that the controversy which will emerge over the disposition of the 24" crude and 20" products lines will equal that which surrounded their conception. A year before the war various members of industry and Secretary of Interior Ickes urged and fought for the project which a group of oil companies was then prepared to carry out, but there was strong opposition in both industry and government which argued that not only could our tanker system be depended upon to supply all needs for national preparedness of war but that the huge lines proposed from the Gulf to the East Coast were not feasible from an engineering performance standpoint. Refusal of SPAB, predecessor of the War Production Board, to allocate the needed steel blocked the project at that time. Later on, German submarines off the Atlantic Coast, which made oil cargoes a special object of attack and ran their scores up to a rate of three tanker sinkings a day, eventually silenced opposition on the first point and American genius finally unloosed proved the fallaciousness of the second.

A number of oil companies were still ready to build the lines as an industry project and the Reconstruction Finance Corporation was willing to supply them with 80 percent of the financing required. However, the division of opinion in the industry and the urgency of the situation when the oil supply system almost collapsed in the dark days of 1942 led to a decision to provide government sponsorship for the undertaking. The same interests that objected to the building of the lines as an industry venture are now those who are vigorously protesting their continued ownership by the government. At the same time as yet they have not volunteered participation in the purchase of the lines from the government now that their war use is finished.

A great many oil executives are unhappily saying "I told you so" to their conferes. If industry had handled the project as was originally proposed, industry would not again be faced with a threat of government control or participation in its business, an issue which it already has to face on many other fronts. In this case the issue is even more than a threat for the government is already in business. The problem is, will it stay?

In order to understand the political factors involved it is necessary to appreciate the magnitude of the dollars and cents and the economic factors concerning the project.

Total government owned pipelines, towboats, tugs and barges and tank trucks constructed for war purposes represent investments of approximately $222,000,000. Of this amount the pipelines alone account for about $154,000,000. The "Big Inch" and the Little Big Inch" lines were the major items, costing $138,500,000.

Due to their spectacular nature, the "Big Inch' lines overshadow the pipeline construction of industry during the war, which, including main lines, reversed and converted and gathering lines built, cost more than $179,000,000 and involved approximately 14,000 miles of pipelines. In money this considerably exceeds government expenditures and in mileage is approximately 3½ times as much as government lines built.

However, the government lines were the great life lines which made it possible for industry to send more than one-half million barrels of oil and products daily across the country not only to win but to shorten the war. Built and operated by industry the lines have not only proved highly efficient but profitable. It is estimated that based upon what the government would have had to pay in subsidies for transporting the same amount of oil by tank car these savings have been sufficient to fully pay for the construction costs of the lines plus all operating expenses and leave a profit of more than $100,000,000.

This is a remarkable record, but at the same time, it is not a completely accurate picture. In case anyone should be tempted to use this as an example of a government owned business which has made a profit he should first examine the overall government oil expenditure picture, for the profit mentioned is based on an hypothesis rather than actual cash received. It is estimated that all government costs for petroleum facilities for this war have amounted to approximately $800,000,000. This includes subsidies of all natures — stripper wells, railroad and others — as well as actual construction. Total oil revenue received by the government, incuding pipeline profits and other sources, was approximately $600,000,000. The net loss to the govern-

*Tankers Handled Bulk of East Coast Shipments in Prewar Period. (Charts from the Sohioan of The Standard Oil Company of Ohio)*

ment to date in the overall oil picture is $200,000,000.

Since the pipeline operations have been wartime activities conducted with the cooperation of industry, pooling of products and without competition, it is difficult to pin down just what the profits involved actually are for the bookkeeping must always be started with a premise rather than be conducted as that of a private commercial enterprise would be.

However, no matter what bookkeeping method is used, it is at least apparent that the "Big Inch" lines have paid for themselves under abnormal conditions. Furthermore, it is obvious that due to the size of the investment, the great capacity of the lines and the great part of the country they traverse, that any operation of these lines in peacetime would have to be a joint industry venture just as their wartime operation has been conducted by a joint industry committee.

It is at this point that the single greatest unsolved oil industry problem raises its head again — the interpretation of the Sherman antitrust law. Those within industry who oppose purchase of the lines insist that such a joint industry peacetime venture would be subject to prosecution by the Department of Justice. The very possibility of this is enough to prevent the formation of a sufficiently large group to make a purchase proposal.

There are also those in the industry who believe firmly that there is no need for nor justifiable use of the lines in our peacetime economy. They maintain that their continued use for transportation of crude oil from Texas to the East Coast refineries would be inefficient and uneconomic in comparison with tankers. They say the same amount of crude oil that can be carried by the two lines can be hauled by 65 tankers with greater flexibility of deliveries at the various ports en route. Cost comparisons, however, would depend upon whether the lines were run at full capacity. It has been estimated that the "Big Inch" costs average nine cents per barrel which would be stiff competition to tanker transportation. However, it must further be taken into consideration that deliveries for the immediate future are certain to decline and that for a period, at least, pipeline costs would probably increase. In addition, it must be considered that future operation of the lines undoubtedly would involve the building of new lines to eliminate the present high delivery cost of crude to Longview which is excessive due to the wartime necessity of utilizing existing gathering lines. At present this cost averages 25 cents per barrel.

*War Emergency Caused Shift to Inland Movement of Crude and Products.*

If the lines were used to deliver crude to the interior areas of the Ohio Valley and Great Lakes they would compete with and lay idle the existing industry facilities already within the areas which are adequate for peacetime needs. The same would h ld true if the lines were used to deliver refined products to the areas.

It is unquestionable that the use of the lines in either of the ways would create economic upheavals in the entire industry's economy. How the situation could be worked out to complement existing facilities if they were owned jointly by industry is another matter and would depend upon whether industry could or would acquire the lines and under what conditions.

The independent refiners, marketers and producers are strongly opposed to the continued use of the lines and believe that the only logical solution is to fill them with oil, seal them at each end and maintain them as a military reserve as a part of our national preparedness program. They feel that the lines have fully justified their construction at no burden to the taxpayer and that they should not be used in competition with established industry facilities.

The companies which control our greatly expanded tanker fleet naturally prefer to use its facilities rather than those of the lines and feel that this can be done at no greater cost to the consuming public. In 1939 the United Nations combined tanker fleet consisted of 1,324 tankers of which United States interests owned only 35 percent, but today the fleet has been increased in number to 1,530 tankers of which United States interests own 67 percent and tonnage has been vastly increased due to higher speed and efficiency.

There is still another alternative for the use of the lines and that is to convert them to natural gas. The gas industry favors this procedure and considers it feasible if the lines could be acquired at a reasonable costs.

E. DeGolyer, outstanding independent geologist and expert, testified before the O'Mahoney committee that the United States has a proved gas reserve of 140 trillion cubic feet, considering only those fields with 20 billion cubic feet or more, and that making allowance for probable extension of discovered fields and lesser fields not considered, the overall reserves are probably on the order of 200 trillion cubic feet. Of these reserves a large amount is in the areas where the "Big Inch" system begins. If these lines were used for gas — and their size is normal for the gas industry — it is estimated that in 25 years they would deliver 2½ trillion cubic feet of gas which is less than two percent of our present total reserves.

There is an ample market in the East for natural gas and the use of the lines for this purpose would ultimately lower fuel costs to the consumer as well as provide him with increased types of services for gas such as house-heating, water-heating, air-conditioning and industrial processes. It is probable that the coal and railroad interests would strongly oppose such a project, but the gas industry estimates that this natural gas would not upset the present energy balance between coal and electricity. It would, however, displace a certain amount of oil now consumed. Furthermore, this use of natural gas would offer an additional outlet for Texas gas, much of which is produced in association with crude or condensates and would permit increased production of the latter product as well as proper conservation of the gas. No extensive changes in the lines would be necessary to convert them to gas although new gas compressing stations would be required.

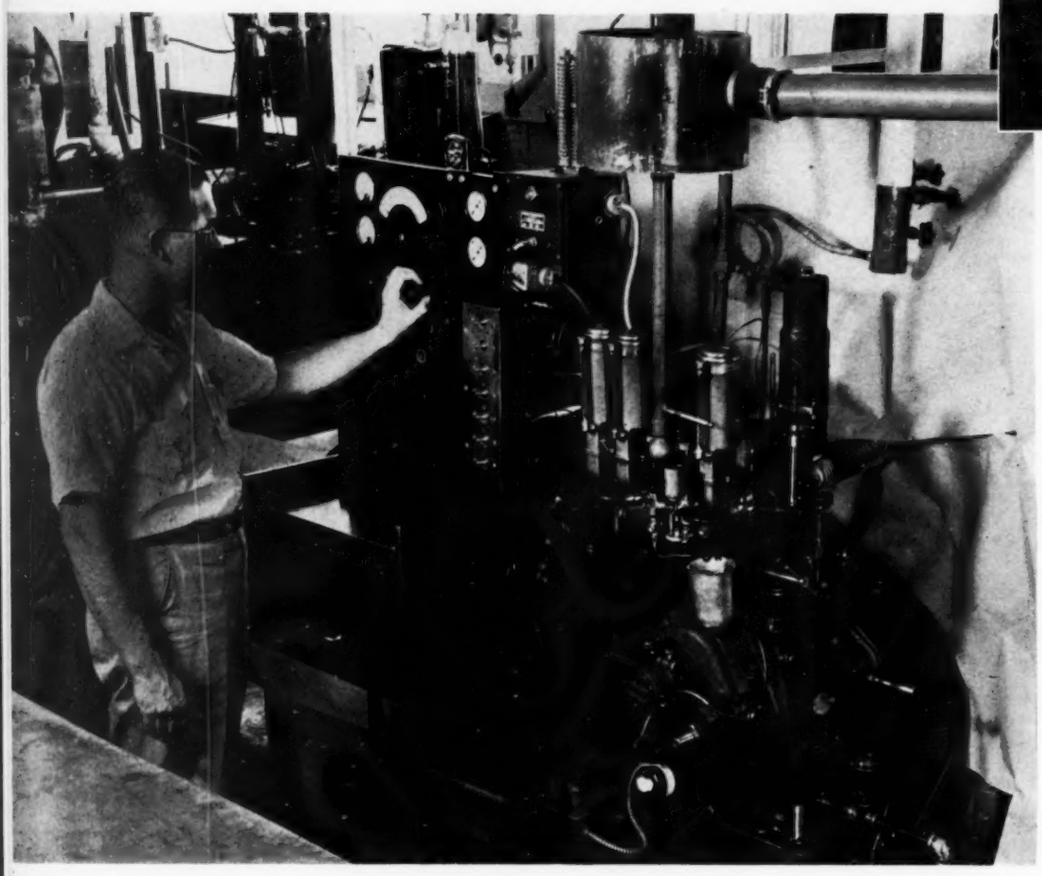
As yet, the government has given no indication of what its position will be on the disposal of the lines. The Reconstruction Finance Corporation at present is having an independent engineering survey made of the lines and the economic factors involved. From the present trend in disposal of other war plants it does not seem likely that the government will look favorably upon continued ownership of the lines. However, if no concrete proposal is made by industry for their disposal and the government considers that their continued operation would be of public benefit it is conceivable that the government would continue to operate them or lease them, which would still keep them under government control.

Obviously, either the oil or gas industry, or both, must take the initiative in providing a concrete answer to the question of whether or not the government will stay in business.

And if the government does not wish to compete with private enterprise it is high time that it took the initiative in solving the antitrust problem satisfactorily so that industry can know where it stands in expanding peacetime operations whether they concern the disposition of the "Big Inch" system or industry participation in government sponsored world oil agreements.

# AVIATION FUEL PROBLEMS OF THE PEACETIME ERA

**By R. T. Goodwin,**
**Manager, Aviation Dept., Shell Oil Company**



*Left: Engine Fuel Testing on the Standard CFR Unit is a Necessary Adjunct to Flight Testing.*

*Fighters such as the Grumman Wildcat are Sensitive to Fuel Quality.*

***Volatility, Purity and Anti-Knock Value Are Main Requirements to be Considered by Petroleum Suppliers — Four Grades of Aviation Gasoline Should be Sufficient for Most Commercial Uses — Cooperative Studies of Safety Fuels and Determination of Flight Performance Standards Suggested.***

ALMOST overnight the thoughts of the aviation industry have been switched from war to peace. The growth of commercial aviation, which was so abruptly arrested by the outbreak of war, is once again in progress and there is no doubt that it will proceed at a pace that was undreamed of in 1940. Even should the family plane not become as commonplace as the car after World War I, there are other and powerful stimuli to peacetime aviation. Commercial flights, both continental and transoceanic, will be inaugurated with new and improved service, express shipments will more and more be by air, plant dusting, fire patrols, surveying and other specialized services (including divorce) will take advantage of the speed and flexibility of the plane. Since it falls to the petroleum refiner to meet the fuel demands of this expanding industry, considerable attention is being given by this partner in aviation to the manufacture and distribution of the best fuels at the lowest cost in the post war era.

In any conventional reciprocating internal combustion engine there are two main problems:

(1) to introduce into the combustion chamber a balanced mixture of fuel and air with a minimum possible expenditure of energy, and (2) to burn this fuel and air in such a way that we extract the greatest possible amount of heat energy in the time at our disposal and in such a way that the waste products are most readily eliminated. To put this into the language of the petroleum supplier, we need adequate volatility to take care of the first point and adequate anti-knock value to take care of point two.

The supplier also has two other problems that are not directly connected with the engines but which are of considerable importance to the user and involve some expense to the producer. The first of these is a requirement involving what might be termed "purity" and maintenance of that purity from the time the fuel is blended in the refiner's storage tanks until it finally arrives in the aircraft fuel tanks. The second requirement is that the different types of engines and aircraft operating throughout the world or shall we say, throughout the supplier's territory, must be supplied with a minimum possible number of grades. This restriction in the number of grades is necessary in order to keep down the cost of installing large numbers of tanks and duplicate handling facilities, a cost that must ultimately be borne by the consumer.

Now as mentioned above, fuel requirement problems are divisible into two portions, the first being to get the fuel into the combustion chamber. To introduce the fuel mixed with the proper amount of air into the many combustion chambers of the large reciprocating type spark ignition engines, the type which is now by far the most commonly used for airplanes, is something of a problem. We have first to transfer the fuel from the airplane's fuel tanks by suitable lines, pumps, and a metering device such as a carburetor or fuel injector, mix it with the proper amount of air and distribute the fuel and air mixture evenly between a number of different cylinders.

Broadly speaking from a refinery standpoint it is not a very difficult problem to produce the volatility requirement requested by the engine

*Right*: *Gassing-up a P-38 Lightning.*

manufacturers. True, care has to be exercised to avoid upsetting the refinery balance if the cost is to be kept at a minimum, that is to say aviation fuels must not demand unduly large quantities of certain fractions which are required for other markets or for refinery processes manufacturing products for such markets. In the lower octane ranges, i. e., not above 91, the tendency will be for a refiner to make fuels on the volatile side i. e., somewhat lower than 257°F.—90 percent point, since the lighter fractions are more responsive to the actions of tetraethyl lead. However, when we get into the higher knock rating ranges where synthetically produced hydrocarbons are used (or should we use such synthetically produced hydrocarbons for the 91 bracket) there may be a demand for engines capable of using fuels having a somewhat higher 90 percent point.

A factor which must not be forgotten by the refiner when asking for less restrictive limits on volatility is not only the equality of distribution per se, but also the equality of distribution of the high anti-knock components. It could, for instance, readily be visualized that one cylinder might get not only an overly rich mixture but also a mixture overly rich in high anti-knock components, thus starving the lean cylinder of these components and causing it to knock. Some evidence of the possibility of this has been noted in certain engines in which the distribution of the ethyl fluid between the cylinders has been very unequal, thus causing not only detonation trouble in certain cylinders but also serious lead deposition trouble in cylinders receiving too much lead carried in by a small amount of unvaporized heavy ends. Furthermore, there is evidence that the lead is selectively distributed from the ethylene dibromide leaving only a small fraction of the necessary dibromide in those cylinders receiving too much TEL.

Limitation and control of the initial portion of the boiling range is determined primarily by the necessity of transferring the fuel properly from the airplane's fuel tanks to the mixing chamber or carburetor without excessive loss and in the quantities desired at all times. Basically speaking, this means that we must not have too many volatile constituents present since they will either vaporize in the fuel tanks and go out through the vents, thus showing high fuel consumption, or they will boil in the fuel line and cause an obstruction in the fuel flow, commonly called "vapor lock". The tendency of a fuel to give rise to high fuel tank losses and vapor lock in the fuel line and sump is usually measured by the Reid vapor pressure of the fuel and experience has shown that this should not be above seven pounds. Most aircraft fuel systems are now designed to handle fuel of this vapor pressure satisfactorily, but the matter deserves continuous and close attention by the engine designer if trouble with new type of airplanes is to be avoided and particularly if light aircraft are to be designed to handle automotive fuel. The Coordinating Fuels Research Committee has devoted considerable attention to the problem and numerous reports are available to those interested.

The second problem in any internal combustion engine is that of burning the fuel smoothly and completely, i. e., without knocking. Now in aviation spark ignition type reciprocating engines this has to be done frequently at very high charge densities and possibly at high compression ratios, and this, in turn, needs a fuel of high anti-knock value.

In 1915, fuels for aircraft had octane ratings in the neighborhood of 70, while today the airplane engine designer can take advantage of 100 octane gasoline. As a result, horsepower per cubic inch has increased from 0.3 to over 0.8. It would be misleading, in the author's opinion, to predict how these quantities will change in the next few years, particularly in view of the development in the gas turbine field. However, it is safe to say that some supplies of fuels higher in octane than the present top military grade will be available in the postwar period, though at what cost it is not possible to say. Developments in the past few years have shown the petroleum industry how to synthesize fuels of very high anti-knock value but some of the components of these fuels are not exactly economical in peacetime even when due allowance is made for improved engine design. Should sufficient quantities become available, they could be justified during wartime where the nature of the competition is such that the upper operating limit of anti-knock value is the only one acceptable to the military services, and in peacetime, it is possible that in some extremely long range commercial operations, such as trans-oceanic flying, the upper operating limit may be profitable.

Before either the aircraft industry or the petroleum industry can calculate with any reasonable degree of accuracy the worth of the new type of hydrocarbons produced by these synthetic methods, there is a really urgent need for some method of translation of laboratory engine knock results in terms of flight performance. At the higher compression ratios, the maximum cylinder pressures rise extremely rapidly while the gains in thermal efficiency or brake mean effective pressures are comparatively slight. Since the weight of the engine and its reliability is largely governed by the maximum pressure which must be taken care of it is conceivable that in the overall picture there may not be too much future in the higher compression ratios and, hence, the need for the very high anti-knock values may not materialize. Furthermore, when we are confronted with a job of translating engine thermal efficiency into terms of pounds of fuel per aircraft flight between two given points, we must consider other factors not directly relating to any test data, such as arbitrary regulations on the total fuel load required for a given trip which may easily overshadow possible differences in thermal efficiency.

In recent months considerable thought has been given to the matter of the relation between laboratory results and flight performance, and extensive flight tests have been made. As a result, projects are now under way which promise success in the solution of this problem, and it is to be hoped that before long flight performance as limited by anti-knock value can be calculated from small-scale laboratory data and thus the true worth of increased anti-knock value for reciprocating type ignition engines obtained. Such a basis is felt to be the most equitable one

for calculating price differentials between the various levels of anti-knock value and it is perhaps the most important problem now facing the two industries in regard to improvement in present day conventional reciprocating type spark ignition engines.

Up to now we have been discussing airplane fuel requirements considering the fuel as already in the aircraft tank and without regard to those characteristics that may be said to come under the general head of "purity". Under the classification of purity come all those irritating clauses to the petroleum refiner, such as material and workmanship, water tolerance, sulfur, gum, corrosion, freezing point, etcetera.

It is not proposed in this article to go into all the pros and cons or the degree of restriction otherwise of the limits now being put forward by the manufacturers and our line operators, or the significance of the test methods now used and demanded for post war. In the author's opinion many of the proposed restrictions are unduly severe particularly since the significance of the test methods are often doubtful as, for instance, in the case of the acid heat test. The petroleum industry must be primarily responsible for insuring that the gasoline reaches the aircraft tanks free from all water, gummy and corrosive materials though the right of the user to demand special restrictions is fully recognized. Obviously, therefore, it is a matter of mutual agreement as to how much, if any, of these so called "impurities" can be tolerated by the engine-aircraft combination under the conditions which this combination is used in service, and whether the test method employed is a satisfactory safeguard.

Perhaps the most important items in the "purity" requirements is gum stability. Considering the amount of handling a fuel is likely to get, the problem of stability is not negligible; in some cases between the time the fuel leaves the refinery storage tanks and the time it ends up in the airplane tanks it has been in storage for years in partially filled drums at temperatures as high as 120°F. The petroleum supplier's knowledge as to how to handle the second part of the problem has been considerably improved of late, owing to the necessity of providing extremely stable fuels against military requirements and should it prove necessary for certain international commercial operations where long-time storage under difficult conditions is encountered, the petroleum supplier will be able to meet with the aid of inhibitors and by specially treating the gasoline any demand the operator is likely to require. However, these inhibitors and treating processes do add to the cost of the gasoline and it would seem unnecessary to insist that all supplies of commercial aviation gasoline meet rigid military requirements.

From the petroleum supplier's viewpoint probably one of the most expensive items he has to consider is the question of number of grades of aviation gasoline desired by his various types of customers. Grades are usually and most readily defined in terms of knock-rating (with a possible subdivision in terms of stability as mentioned above), but further subdivisions, it is claimed, are unnecessary and even minor divisions between various knock-ratings should be frowned upon. It is the author's opinion that a maximum of four grades is all that should be required to service the whole conventionally powered aircraft market from the light airplane up to the large trans-oceanic liner. Presently there are seven recognized grades according to Army-Navy specifications. The lowest grade might well be 80 octane number for the light and medium type aircraft. The next grade would be a 91, possibly 92 or 93, for ordinary commercial aircraft, particularly the relatively short range feeder line and main line operations.

The two top grades might well be the present 100-octane grade are now specified by the military under Specification AN-F-28 and possibly a higher grade for extremely long range trans-oceanic aircraft with, say, a 20 percent increase in lean mixture rating. The above octane numbers are the lean mixture or cruising ratings and each grade should, of course, have its corresponding rich mixture or take-off rating. It should again, however, be emphasized that the relative ratings required by the various engine manufacturers and operators should, if possible, be so adjusted that the suppliers are not forced to put out two grades with practically the same anti-knock ratings: one with a high and the other with a low rich rating for given lean mixture rating.

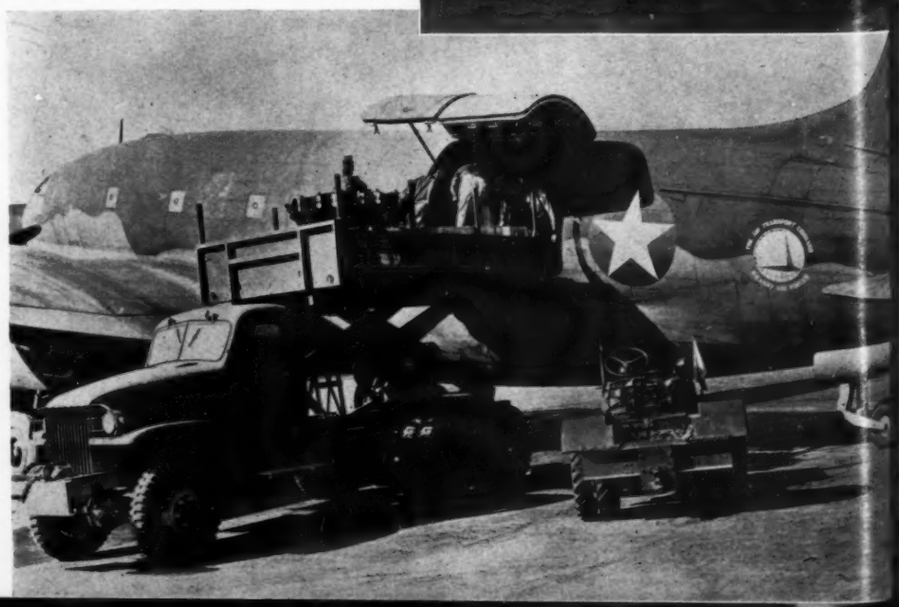
We must also remember that in the immediate future the petroleum supplier will still have to supply substantial quantities of military aviation fuel and, therefore, at least one commercial grade must tie in with the military specifications in order to avoid supplying an additional grade.

Any discussion of the number of grades required to service the light aircraft field raises some rather interesting speculations as to whether or not these aircraft could successfully use motor fuel. At first sight, from the point of view of distribution, this would appear to be an attractive proposition; however, in order to produce a satisfactory aviation fuel, motor fuel would have to be considerably more stable for the private airplane is likely to need refueling in remote fields where the fuel has been on hand for a long time under adverse storage conditions.

Furthermore, while a combination of motor fuel and aviation fuel might be possible from the point of view of knock rating and lead content, it is doubtful whether the vapor handling requirements of the fuel system of a private small airplane could be pulled into line with the vapor handling and starting requirements of motor cars. In other words, the average airplane in winter could probably not handle a fuel possessing the high vapor pressure at high initial volatility demanded by motor fuels to give them adequate starting. Thus, if the future light airplane is to be capable of using motor fuel this problem is perhaps the most important one to be solved On the other hand, the manifolding and distribution system of a light aircraft engine capable of

*Mechanical Conveyor for Quick Loading of Passenger Baggage.*

*The Army Transport Command Uses Trucks with Special Bodies for Rapid Cargo Loading.*



adequately handling motor fuel might require the employment of a rather excessive amount of carburetor heat which in turn would reduce specific power output of the engine. This would either mean increasing the size of the engine or decreasing the speed of the airplane, both of which would detract from its attractiveness. It is still too early as yet to draw any conclusions, but it might be interesting to have the reactions of the light plane manufacturers on the possibility of using motor fuel of say 80 octane (motor method) containing approximately two cc's TEL per gallon with vapor pressure as high as twelve pounds and a 90 percent A.S.T.M. distillation point as high as 392°F. Such fuels would be made almost entirely from cracked stocks but there is no reason to suppose that they would per se be unsatisfactory.

To summarize the above:

Undue restrictions on the volatility limits, particularly of the higher anti-knock grades, may have some tendency to increase the cost of the fuel to the operator. However, because of the increasing competition from the gas turbine, some studies might be made on the possibility of producing in quantity high anti-knock "safety fuels", i.e., fuel of a minimum of 105°F. flash. The subject of ethyl fluid distribution in the engine's inlet manifold is also worth cooperative study. There is great need for a suitable method for interpreting laboratory knock ratings in terms of flight performance so that the true value of high octane fuels can be agreed upon both by the user and the producer. The expense of flight testing is such that it is quite impossible to test every new fuel in flight; and, apart from the necessity of flight testing new additives, flight testing of new fuels containing only hydrocarbons is hardly justified.

The petroleum supplier will wish to cover the range of aircraft fuels required with the fewest possible number of grades and with the minimum amount of restrictive clauses, particuarly those clauses which relate specifically to the chemical composition of the fuel and its "purity". It is suggested that four grades are sufficient and apart from anti-knock value all grades could have the same specification; although under special circumstances the possibility of having two different storage stabilities may have to be considered if unusual stability is needed by some operators.

The possibility of using motor fuel in the light airplane field is worth considering, and, if this is to be an accomplished fact, designers of these planes must be prepared to incorporate fuel systems capable of handling fuels of as high as 12-pound vapor pressure in winter climates at their service ceiling.

*Photos Courtesy "Air Transport"*

*Above Left: Fruits and Vegetables will be an Important Part of Future Air Cargo.*

*Cargo Space in the Fairchild Packet is as Large as a European Boxcar.*

# RAPID GROWTH FORESEEN FOR CARGO PLANES

***Huge Potential Tonnage for Air Lines in Handling Emergency Freight, Perishables and Costly Merchandise Where Time is Factor—Surveys Forecast Investment of Half Million Dollars in 1947 and Movement Exceeding 100 Million Ton-Miles Within Five Years.***

IN 1931 the aircraft manufacturing industry was 75th in size in the United States. In 1944, with a million employees, it stood first among American industries. No one suggests that aviation can continue to fly so high now that the war contracts are gone. But there is a bustle and stir in the industry, a feeling of anticipation, a determination to force other methods of transportation to move over and make room for a newcomer. The industry is definitely ambitious.

Between the two wars the motor truck took a substantial slice of freight business from the railroads. With factory-to-store delivery, the motor truck reduced the time in transit, eliminated handling, simplified packaging and, on short hauls, reduced costs. Take petroleum as an example. A tank car of 10,000 gallons capacity will turn around not more than four times a month on short-haul service, will thus deliver 40,000 gallons to near-by bulk plants in thirty days. A 4,000-gallon truck transport will deliver 8,000 gallons per day or about 200,000 gallons per month. More important, it will take the gasoline direct from refinery or pipeline terminal to service station, bypassing the bulk plant and eliminating two pumping operations, storage and handling losses.

Aviation cannot hope to duplicate the growth of the motor truck as carrier of freight but the

industry is mapping its program in a spirit of realism. The whole cargo carrying field has been studied and the most promising areas selected for development.

The plane as a cargo carrier has the same disadvantage as the railroad; goods must be carted from factory to airport for loading and, at destination, from plane to consignee. The local truck hauls usually are much longer than for railroad shipment. Loading and unloading goods from a plane is relatively slow business as many air passengers know, having had experience of waiting ten to twenty minutes for hand baggage after landing.

Aviation has not overlooked these factors. The major emphasis is on speed on the ground as well as in the air. Time and motion studies are being made at many ports. Air Transport magazine has featured many articles on this subject in the past year. Special equipment has been designed to speed loading and unloading. Airport designers are suggesting two-level docks for fast loading of planes carrying both passengers and express. At one airport a portable loading platform adjustable to any height was built to permit the stowage of a 6,000-pound cargo in less than a half hour and unloading in ten to fifteen minutes. Major A. J. Deveraux, the designer, dubbed it "Deveraux's Folly" but few agree with the adjective.

Before the war 60 percent of air express tonnage consisted of machinery, hardware and printed matter. Half of the revenue came from this class of cargo. The machinery and hardware shipments were largely "emergency" in character such as repairs or parts where lost time was costly. Experiments, during the war, suggest that there may be a shift in the types of cargo. About a year ago American Airlines began promoting shipment of perishables over long distances in airfreighters at deeply cut rates. The former air express rate from Los Angles to New York was $84 per hundred weight. American cut this to $32.50 on minimum 5,000-pound shipments of fruits and vegetables or to $48.60 on small shipments. Clothing rates were cut from $84 to $48.60 or $57.60, depending on weight per cubic foot.

The aviation industry sees clearly that postwar tonnage will be a function of rates. Wayne University at Detroit has conducted a survey in which it found that the potential tonnage at 15 cents per ton-mile is six times the actual tonnage carried by the air lines in 1941. At ten cents per ton-mile the potential rises to 15 times the 1941 volume, at seven cents to 80 times, at five cents to 233 times and a three cents to 968 times. Today strawberries will stand a rate of 15 cents per ton-mile because buyers in the cities will pay a premium for field ripened, tastier fruit. At ten cents other fruits will take to the air and at seven cents vegetable and fruit cargo will be tremendous. Wayne University believes that U. S. planes would enjoy 24,419,000-ton-miles of fruit and vegetable cargo business at a 15-cent rate, 63,714,000 at ten cents, 333,127,000 at seven cents, 967,711,000 at five cents, and 4,018,743,000 at three cents.

*ATC Plane Performance Forecast Peacetime Air Cargo Developments.*

*Milady's Flowers by Air from the Tropics.*

Rates aren't that low yet but are gradualiy being lowered and even at present rates the volume of air cargo is growing rapidly. Air express volume in 1931 was 200,000 ton-miles, in 1940 it was 3,500,000 ton-miles. Even at a rate of 40 cents it is estimated that 1950 business will be up to 65,500,000 ton-miles. General opinion is that the rate will be down to about 30 cents by 1950 and air express tonnage up to 110,000,000 ton-miles. Glenn L. Martin said recently that a seven-cent rate is in sight with an 80 percent load factor on one of his newer planes. A Canadian company is working on a refrigerated plane which will carry 80,000 pounds of perishables at eight cents per ton-mile.

The aviation industry is offering to reduce costs for some shippers such as those dispatching gems, gold or other high-value products where insurance and interest costs can be cut by quick delivery or where inventories can be kept low. Rates on shipment of unaccompanied bodies of deceased persons now are lower than rail rates.

The industry offers to increase sales for certain classes of customers. Bobby soxers can have their phonograph records of new hit songs quicker. Fashions can reach consumers in Chicago or San Francisco a matter of hours after the first showings in the east. The industry offers exotic fruits and flowers, lilies from Bermuda, orchids from the Amazon, strawberries from Florida, pineapple from Cuba, all at their peak of beauty, fragrance or flavor.

While aviation men expect a considerable volume of air cargo to move in special cargo planes such as the United Airlines "Cargoliners" it seems probable that the bulk will be carried in combination passenger and cargo planes at least in the immediate future. Four types of planes probably will be basic in the immediate post-war domestic commercial fleet:

(1) For short haul, feeder line service, 2-motor planes of 17,500 pounds gross weight and a cruising speed of 150-160 miles per hour at 8,000 feet.

(2) For inter-city combination light cargo and passenger service 2-motor planes of 45,000 pounds gross weight and a cruising speed of 200 miles per hour at 8,000 feet.

(3) Transcontinental planes with four engines of 12,000 horse power, 150,000 pounds gross weight and a cruising speed of 250 miles per hour at 10,000 feet.

(4) For mail and express planes not carrying passengers suggestion has been made that 2-engine planes of 2,500 to 4,400 horsepower with 28,000 to 62,000 pounds gross weight may be found most useful. These would be relatively high speed planes with a cruising speed of 240 or 250 miles per hour.

The Fairchild Packet is an example of the "work horse" type of plane which is being developed

for post-war freight hauling. This plane has a main cargo compartment exactly the size of the standard European boxcar, 8 x 8 x 26 feet and a total capacity of 2312 cubic feet. It is a 2-motor plane of 48,000 pounds gross weight, and will carry an 18,000 pound payload on 500-mile trips at a cruising speed of 250 miles per hour.

There will be a considerable number of DC 3's kept in service after the war as at present. These are the 21-passenger planes of today which may be used to carry 5,500 pounds of freight when employed in that service. They are powered with two 1700-horsepower motors.

All this will require a huge investment. It is estimated that in 1947 United States airlines will spend $512,000,000 for planes. This will include 100 international planes costing $1,250,000 each, 600 large domestic carriers at $425,000 each and 1000 smaller planes at $125,000 each. Compare these proposed purchases in one year with the total domestic air fleet of 380 planes in 1936 and 453 in 1941.

In 1936 commercial planes carried 1,129,765 passengers, in 1941 4,380,610 passengers. William A. Burden, aviation assistant to the Secretary of Commerce, estimates that 20 million passengers will be carried in 9,000 planes in 1950. He thinks 17,300 passengers will be handled daily at La-Guardia Field, 10,000 at Chicago, 8,700 at Washington and 5,000 at Cleveland.

From the oil industry viewpoint, all this anticipated expansion means a large increase in the demands for aviation fuel and oil. The increase will not be in proportion to the growth in traffic.

In 1936 the airlines consumed 37 million gallons of gasoline and 873,572 gallons of lubricating oil. In 1941 gasoline consumption was 93 million gallons and lubricating oil consumption 1,558,518 gallons. Specific fuel consumption has been brought down from 0.45 pounds per horsepower hour to 0.4 pound and the industry is shooting at a goal of 0.36 pound.

Whatever the economics it now seems apparent that the aviation gasoline and aviation lubricating oil consumption curve probably will rise at a much faster rate in the next few years than did the consumption curve for automotive fuel and lubricants after the last war.

*"Deveraux's Folly" Another Approach to the Problem of Quick Cargo Loading.*

*Right: Truck Transport by Air Became Commonplace in the War.*

# PROBABLE DEVELOPMENT OF AIR TRANSPORT

**By Buell A. Patterson***

VOLUMES have been written on the probable development of air transport in the future, and the predictions about the luxury airliners which will be flown, together with guesses as to their speed, size, and appointments have frequently soared to fantastic heights of imagination.

It is probably true that within the relatively near future, possibly within the next eight or ten years, there will be 150 to 200-passenger planes which will easily fly non-stop, coast-to-coast, to Europe, Africa, Asia, and other far distant lands. On such extended routes high speed, stratosphere flying and ultra luxurious appointments will be all important.

But for the vast majority who will fly from New York to Florida, St. Louis to Chicago, Denver to Los Angeles, to South America and to Europe in the immediate postwar days and for some years thereafter, airplanes of such gigantic size and terrific speeds, will not be in the picture. It takes too much time and too much money to perfect the sky giants with the time and facilities at our sane disposal.

In support of this last contention statistics show that before this war 85 percent of all domestic airline traffic in the United States, which led all other countries in commercial aviation, was carried on flights of less than 500 miles. Eight out of our major airlines had no route segments as long as 500 miles, and the average trip length was approximately 200 miles.

The pattern will not change materially after the war. Any increase in the number of longer flight segments will be more than offset by the increase in the number of shorter flights as new centers of population are added to our growing air transport map. That this map is due for major changes is seen by the fact that present domestic airline operators have applied for enough additional routes to more than double the 40,000 pre-war route mileage. New operators also are seeking routes. For such comparatively short hops, huge stratosphere-flying airplanes, even though they are powered by no more than four engines, would be uneconomical.

After the above analysis, just what kind of an airplane can we expect when we arrive at the airport to take a necessary business trip, to com-

**Sales Promotion Manager, Curtiss-Wright Corporation.*

mute, or to take a long delayed vacation?

If we get down to cases, for the next year or two, unless we are flying coast-to-coast, we are going to board an airplane very similar to the ones in which we flew before the war. We are going to pay only slightly lower rates. But we are going to enjoy a higher degree of comfort, speed, convenience and dependability than ever before. We are certainly going to discover that a goodly number of the technological advances made under the impetus and acceleration of war have been adapted to the 14, 21, and 40-passenger planes in which we fly. If we take that trip a year or two later, we shall find a considerable addition of larger and faster equipment ready to serve us.

A practical way to avoid prognostication and give an accurate picture of the airliner of the immediate future is to describe the Curtiss-Wright Commando which in its war transport version has flown the most exacting terrains in the world, for it will be one of the first all-new, post-war luxury airliners in which you will have an opportunity to fly along with such other planes as the Skymasters and Constellations, for this plane and those named are already on order by the airlines. The Commando will offer passenger luxuries and conveniences amazing even to seasoned air travelers.

The layman, even though he has flown in the past, is not aware that airplanes are not built in a day, but that they are the products of many minds and many hands. They take years to design, test and perfect. The Commando's history of development is typical. It goes back to the late thirties when it was first conceived. Before it was perfected the war was on.

At that time, Britain's plight was desperate. The Army turned the first newly acquired Commando over to her, and in nine hours and 40 minutes the gallant ship flew to help succor the beleagured island. The British, as is their custom, gratefully named her the "Curtiss-St Louis" — a tribute to her makers and the city in which she was built.

The Commando then saw immediate action and covered herself with glory. She replaced six other transport planes and single handed kept beseiged Malta alive and fighting, ferrying food, munitions and supplies to the island through skies black with Nazi warplanes.

The Commando, known to the Army as the C-46 and the Navy as the R5C, and to the nation's airlines as the CW-20, has been the workhorse of the armed forces. In Africa, India, Burma, China, Europe and on other war fronts, the future airliner, clad in war paint, performed and is performing, feats of flight deemed all but impossible but a few short years ago.

In keeping the life-line into China open over the treacherous "Hump" of the Himalayas, three-quarters of all the supplies ferried in were flown by the Commando over the Burma Road of the Air. The rescued nurses of Bataan and Corregidor were evacuated from still blazing Manila in a Commando. Eighty, including the crew, were flown to safety in a ship which was designed to carry thirty-six passengers. Paratroopers of General L. H. Brereton's airborne army, flown in Commandos, plumeted from the skies to blast the Nazis from the fields of France, Belgium and Germany.

Today, the Commando is the world's largest, fastest, twin-engined airliner and offers the flying public, post-war, the utmost in comfort and luxury. When produced for commercial air carriers, this airplane will have a wing spread of 108 feet and will be 76.33 feet long. Power will be supplied by twin Wright Cyclone engines of more than 2200 horsepower each. They will carry a load of more than 10,000 pounds at a cruising speed of 246 miles per hour. The top speed will be 282.5 miles per hour.

Translated into layman's language, this means that the airplane will carry, with ease and in utmost luxury and comfort, 36 to 42 passengers, their baggage and some two and one-half-tons of mail, express and cargo.

The vast cargo holds beneath the cabin floor are high and wide enough to accommodate wardrobe trunks, hand baggage and other cargo, and it will be unnecessary to limit baggage by weight and size as far as cargo loading is concerned as they are restricted today.

One of the outstanding aerodynamic features of this airliner that will contribute immeasurably to passenger comfort and to the operational characteristics of the ship is the exclusive Curtiss-Wright Vee-tab. This simple, fool-proof, automatic device permits the passengers to move freely about the cabin while the Commando is in flight. It also enables the airplane to be loaded faster with practically no regard to weight distribution, because it automatically trims the ship, keeping it in perfect aerodynamic balance.

*A 4-Place $5,000 Private Plane for Which Stinson Division of Consolidated Vultee has a Schedule of 3,500 Units before Dec. 31, 1946.*

*Below: The C-47 "Workhorse" of the Army.*

*Bottom: 36 Passengers Will be Carried by the Postwar Commando.*

*The CW-20 Commercial Version of the ATS Commando Now Being Produced for the Air Lines.*

# SINCLAIR ACQUIRES ETHIOPIAN CONCESSION

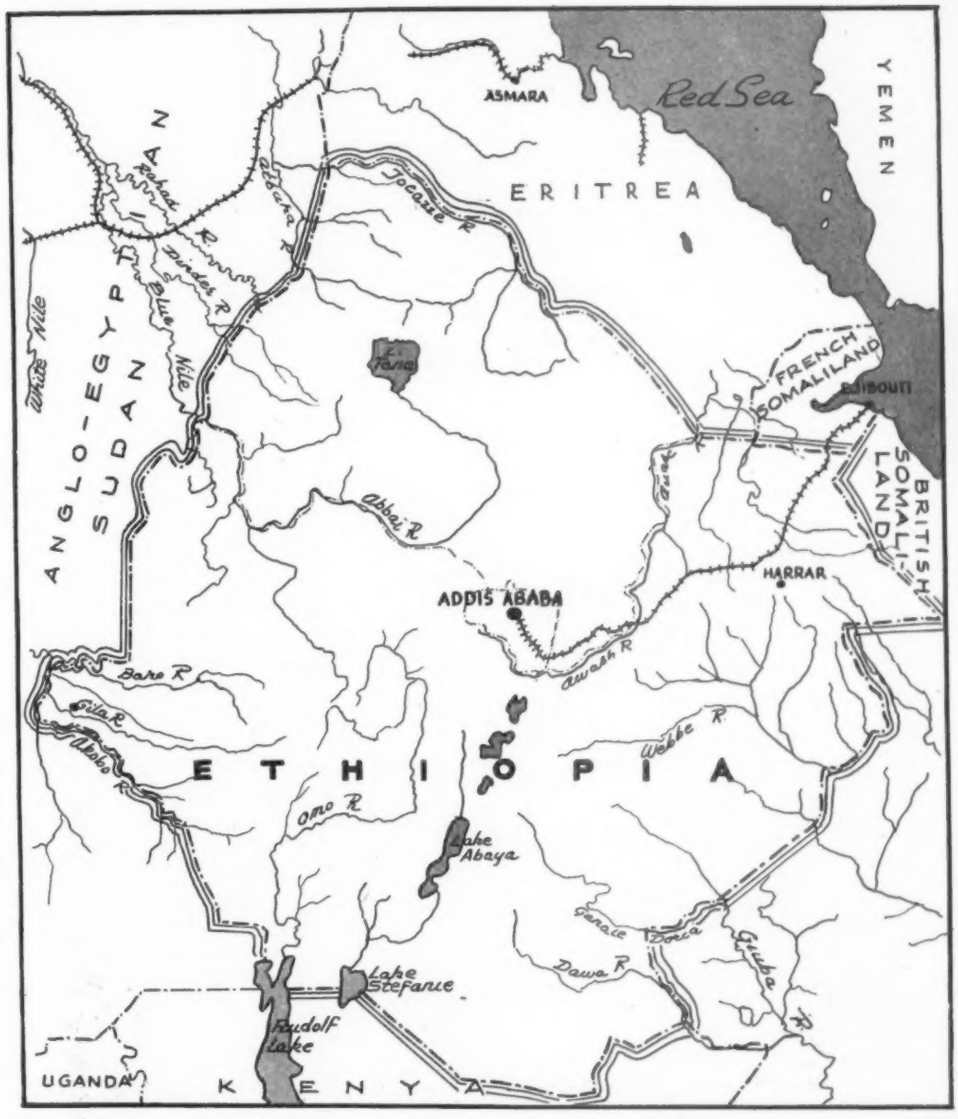
ANNOUNCEMENT that Sinclair Oil Corporation had been granted a concession for the development of petroleum in Ethiopia was made by H. F. Sinclair, president of the corporation, on September 7. The grant was signed by His Excellency Ato Aklilou Abte Wold, Vice-Minister of Foreign Affairs of the Imperial Ethiopian government and by Mr. Sinclair on behalf of the Sinclair Corporation. The concession is for a term of fifty years and, subject to the release provision, affects the entire area of Ethiopia, about 350,000 square miles. All sub-soil rights in Ethiopia are vested in the government.

The government grants to the company "the exclusive right within the lands of Ethiopia to explore, prospect and drill for, extract and render suitable for trade, petroleum and its derivative and constituent substances, and the exclusive right to carry away, explore, dispose of and sell petroleum and its derivative and constituent substances produced by the company under this agreement."

In general, the obligations of the company are "to use its best efforts to develop, after successful exploration, the petroleum industry in Ethiopia." For this purpose the company agrees to set up an organization in Ethiopia and establish headquarters at Addis Ababa. Production drilling shall be commenced by the company as soon as may be practicable after exploration has indicated the presence of petroleum in commercial quantities.

Commenting on the agreement, Mr. Sinclair said: "The development of petroleum in commercial quantities would greatly strengthen the United States economically in the Near East, and would contribute to the economic and social welfare of Ethiopia. The agreement we have made will be carried out in the spirit with which both parties approached the undertaking; that is, with mutual regard for each other's rights and with the full knowledge on our part that the main purpose of the government of Ethiopia has been to advance the well-being of its people. I cannot too strongly stress the fact that in our conversations with the representatives of the Ethiopian government we have found nothing but good will, progressive ideas and an earnest desire to give free scope to the activities we have undertaken, but always with the proviso that the interests of the country be protected."

A noteworthy feature of the Sinclair concession is the obligation assumed by the company to promote the general welfare of Ethiopia. One of the articles of the agreement declares that "the company, being sympathetic to the enlightened and wise guidance of his Imperial Majesty, Haile Selassie I, Emperor of Ethiopia, and his government toward the destiny which, by history and background, Ethiopia so well deserves, intends and desires that if the venture herein contemplated is successful and is a profitable one for the company, it will carry out its policy of devoting a part of such profits for the benefit of the country from which they were derived. Such benefits shall take the form of a trade school or schools, a hospital or hospitals, clinics, sanitary facilities, research organizations and other public institutions for the enhancement, education, health, culture and prosperity of the people of the country."




In addition to this obligation, the agreement provides that the company shall spend certain sums annually for a period of ten years for the education and training of Ethiopian subjects in the United States.

After the first five years of the exploration period it is provided that areas equivalent to approximately 50 percent of the total area of the country shall be released from the terms of the agreement and at the end of the last five years of the exploratory period an additional area of approximately 25 percent shall be released.

The company agrees to build a refinery in Ethiopia "if and when the consumption of the country justifies it and such undertaking is economically sound." In the event of the creation of a subsidiary company solely assuming the performance of the agreement it is stipulated that subjects of Ethiopia shall be given a subscription preference to the extent of at least 20 percent of any issue of shares by such a sub-

(Continued on page 82)

# RAPID RECONVERSION CREATES MORE OPTIMISTIC ESTIMATES OF 1946 PETROLEUM DEMAND

CONVERSION of automobile and allied industries from war to peace now is proceeding at such a satisfactory pace that 1946 may be a better year for the petroleum industry than has been anticipated. Given reasonable freedom from serious labor trouble in Detroit and Akron prewar production records may be shattered before next year has ended.

More than a year ago Allied armies began to roll towards certain victory and guessing V-E and V-J Days became an exciting game in which everyone could take part. Postwar planners were set to work in every industry and economists sought to aid them by estimating the volume of business to be available in the first year after V-J Day and thereafter.

Since April or May, oil industry economists have been using December 31, 1945 as V-J Day for statistical convenience. They have agreed in the main that U. S. crude demand would drop about one million barrels daily in the first year after the war. Four million barrels daily average production in 1946 plus or minus a hundred thousand barrels has been accepted by most students as a necessary rate.

Now that V-J Day is here nearly five months ahead of schedule, the industry's students of the factors which go to make up a valid estimate are busy revising their ideas in line with present conditions.

There are a number of factors present which tend to cause an upward revision of 1946 demand for oil.

(1) The passenger car junk rate is surprisingly low and has been dropping since earlier in the war.
(2) Reconversion of the automotive industry is proceeding rapidly and smoothly.
(3) Tires are expected to be available in adequate numbers to keep old cars running.

There has been a great deal of misinformation regarding the rate of which passenger cars were being junked. Figures of 4,000 to 8,000 units per day have been used. Actually only about 750,000 cars were scrapped in 1944 and the current rate is said to be about 1500 cars per day.

Motor Vehicle registrations at the close of the year in recent years follow:

| | Total Registration | Registration Loss During Year |
|---|---|---|
| 1941 | 34,930,000 | |
| 1942 | 33,110,000 | 1,820,000 |
| 1943 | 30,980,000 | 2,130,000 |
| 1944 | 30,630,000 | 350,000 |

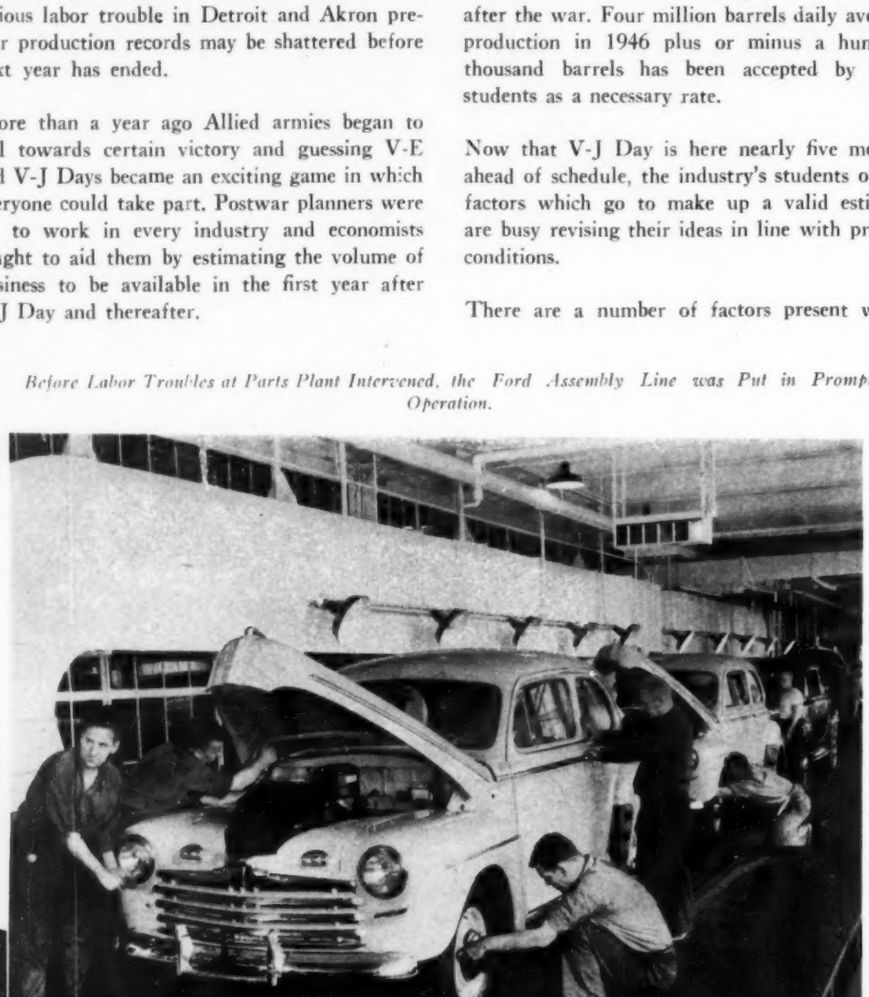
In 1944 the average number of vehicles used or usable was about 30,100,000. This year the number will be about 29,700,000. Trucks and buses have been relatively steady at 4.8 to 4.9 million throughout the war period.

New car production is getting under way in spite of strikes and shortages of certain materials. General estimates have been that the last quarter of 1945 will see 250,000 new passenger cars produced. There are some optimists who think that automobile manufacturers have learned so many production tricks in their war work that that rate will be doubled and a half million shiny new cars may roll off the assembly lines. Others suggest that shortages of parts and commodities such as textiles may prevent reaching any such figure even if labor troubles can be ironed out.

Assuming the lower figure of 250,000 it is clear that the nation's passenger car fleet has ceased to contract and will start expanding before Christmas. Cars will be produced at 2500 per day and junked at 1500 per day in the current quarter.

As for 1946 the lowest published estimates are that 3.5 million new cars will be manufactured. Many economists accept 4.5 million as a reasonable estimate and there are responsible persons in the automotive industry who talk in the 5.5 million range. They think that normal production will be reached by April and that an abnormal

*Before Labor Troubles at Parts Plant Intervened, the Ford Assembly Line was Put in Prompt Operation.*



*On V-J Day this Heil Factory Floor was Filled with Heavy War Goods in Process. This View, a Week Later, Shows how Quickly Reconversion to Truck Tank Fabrication was Accomplished.*

rate of 500,000 cars per month will be achieved by the final quarter.

Accepting the median estimate of 4.5 million new automotive units and the present junk rate, the average number of cars used or usable in 1946 will be on the order of 30.5 to 31.0 million, slightly higher than in 1944.

Those who have been out in the country for a drive since the end of gasoline rationing — and nearly everyone has — have observed a good many disabled cars beside the road. In a vast majority of cases the trouble is tires. Old tires are failing more rapidly than engines, gears or axles. With new cars unavailable for the past three years, it has been proven to everyone's satisfaction that prewar cars became obsolete but did not wear out. Taxicabs, for example, have piled up tremendous mileages. Thousands of cabs are operating after more than a quarter of a million miles. Many students of the automotive industry believe that the present low junk rate can be maintained more or less indefinitely if new tires can be had. The old car may smoke and smell to high heaven but it will continue to run.

There is an astonishingly large pent-up demand for passenger car tires. Rubber people use the nice round figure of 100 million, almost enough to re-tire the whole fleet.

Before V-J Day passenger car tire production was at the rate of 20 million tires per year and the inventory on June 30, 1945 was only 950,000. August production was 2.1 million, still less than half the prewar rate. For the last quarter of this year, however, production schedules call for 12.5 million passenger car tires, not seriously below prewar capacity. With military demand insignificant, all can be used for civilian cars.

Like petroleum the tire industry does not have a serious reconversion problem. Except for molds the machinery now in place is usuable either for war or peace. Before Pearl Harbor annual capacity was 65 million tires. Today that capacity is up to 110 million except for molds.

At the moment manpower is the bottleneck at Akron. The 36-hour week is replacing the long wartime work week but skilled tire workers are not coming back from the Army fast enough to make a three-shift day possible. Nevertheless, it is estimated by some competent rubber observers that first quarter production in 1946 will be 15 million passenger tires and that the year's production will reach 66 million.

If the automotive industry produces 4.5 million new cars with a requirement of 22.5 million tires, there will be 43.5 million tires left for the replacement market. This is only half the estimated 100 million pent-up demand but it is pointed out that retreading will continue to keep millions of cars rolling which otherwise would have to stay in the garage.

Stress is being laid on passenger car tire production rather than on bus and truck tires because tires for such vehicles will continue to be available in adequate numbers. Production will continue at about one million per month. In the first half of 1945 truck and bus tire production for civilian use was 2,655,000 compared with 2,744,000 in the first half of 1941.

There is plenty of rubber in sight to make the tires. Word from Burma says that Japs kept rubber production going and that 200,000 tons of natural rubber is in stock there waiting for boats. It is said that another 500,000 to one million tons will be found in the Malay States.

Reports now current are that the Japanese found it necessary to keep rubber plantations in operation in order to keep the natives occupied even though rubber stocks continued to back up. It is said that the plantations were not seriously damaged by the military before V-J Day.

Synthetic tires are about as good now as prewar natural rubber tires although rubber men still prefer natural rubber, all other things being equal. It is suggested by some in the rubber industry that after shipping space becomes available, synthetic production may be cut back from one million tons per year to perhaps 200,000 to 300,000 tons, all of which will come from low cost petroleum sources unless the farm bloc is able to force a subsidy for alcohol rubber. While petroleum rubber now costs around 20 cents per pound, compared with more than 45 cents for alcohol rubber, this cost will fall as production difficulties are overcome. A selling price of 18 cents per pound is estimated by some for post war synthetic tire rubber made from petroleum butadiene.

With the automotive fleets growing again and enough tires to keep prewar cars rolling there still remains the question as to the milage cars will be operated. This will be affected by the rate of reconversion, unemployment and spendable income. Average passenger car usage in 1941 was 10,000 miles with a consumption of 650 gallons of gasoline. Some oil industry economists think that with widespread unemployment inevitable in 1946 and considering the condition of old cars consumption per vehicle will be below prewar levels. High consumption figures are reached only when long vacation trips are taken and few will start on cross-country jaunts in prewar cars.

Residual fuel oil demand will follow general business conditions as always. Domestic home burner fuel consumption will rise in the next few months as consumers are permitted to burn all they wish. Before the following winter installation of new furnaces in large numbers will accelerate the increase in demand. With refinery crude runs lower than during the war it will be necessary to adjust operating conditions to produce a wider cut of distillate fuel. This will be attractive to the industry only if prices are good.

In a paper prepared early this year for the American Institute of Mining and Metallurgical Engineers, Albert J. McIntosh, Socony Vacuum Oil Company economist, suggested that crude production need not be limited strictly to demand in 1946. He said that above-ground stocks should be rebuilt to about 490 million barrels. His suggestion is that this should be done at the rate of about 55,000 barrels per day.

As one of the conservative group of economists, Mr. McIntosh estimates 1946 crude requirements of 4,109,000 barrels per day including 55,000 barrels for replenishing depleted storage. He estimates imports at 150,000 barrels daily giving a net domestic demand for crude of 3,959,000 barrels per day. His estimates are based on 3.5 million new passenger cars in 1946 and an average annual passenger car consumption of 560 gallons. The most optimistic estimators who accept higher per car consumption figures and base their calculations on 4.5 to 5.5 million new cars come up with a crude demand figure of around 4.3 million barrels net demand for domestic crude. All will watch performance carefully for the next few months until trends are more apparent.

*U. S. Rubber Company, Like Other Tire Manufacturers, Needed Little Reconversion to Begin Turning Out Greatly Increased Quantities of Passenger Car Tires.*

*General View of Absorbers and Stills at Abercrombie - Magnolia High Pressure Recovery Plant, Old Ocean, Texas. Photographs by Harry Pennington, Jr., Courtesy J. F. Pritchard & Co.*

# WORLD'S LARGEST HIGH PRESSURE RECOVERY PLANT HANDLES 350,000,000 CUBIC FEET DAILY

**By H. M. Nelly, Jr.,**

*Manager of Petroleum Division, J. F. Pritchard & Company*

*and*

**Ralph W. Canfield,**

*Superintendent of Gasoline Plants, J. S. Abercrombie Company*

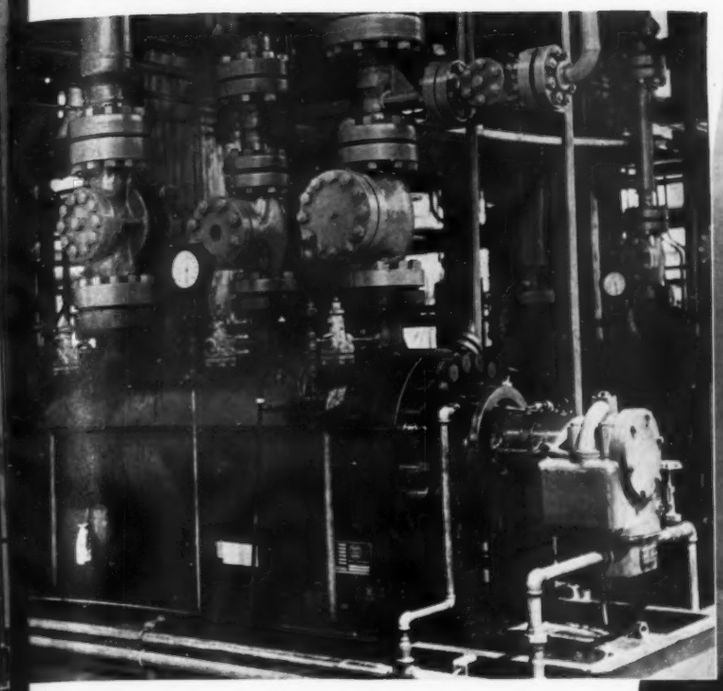
***Newly Constructed Recovery Plant in The Old Ocean Field Recovers 90 Percent of Available Normal Butane and Substantially 100 Percent of Pentanes and Heavier at Pressures Ranging up to 2250 p.s.i. Lean Oil Circulation is 80,000 Barrels Daily and Cooling Water 17,000 Gallons Per Minute.***

GAS conservation measures, together with the desire on the part of oil field operators to recover a maximum amount of light oil from the so-called high pressure distillate fields, has brought about during recent years the development of high pressure hydrocarbon recovery systems operating at pressures up to 2250 pounds per square inch.

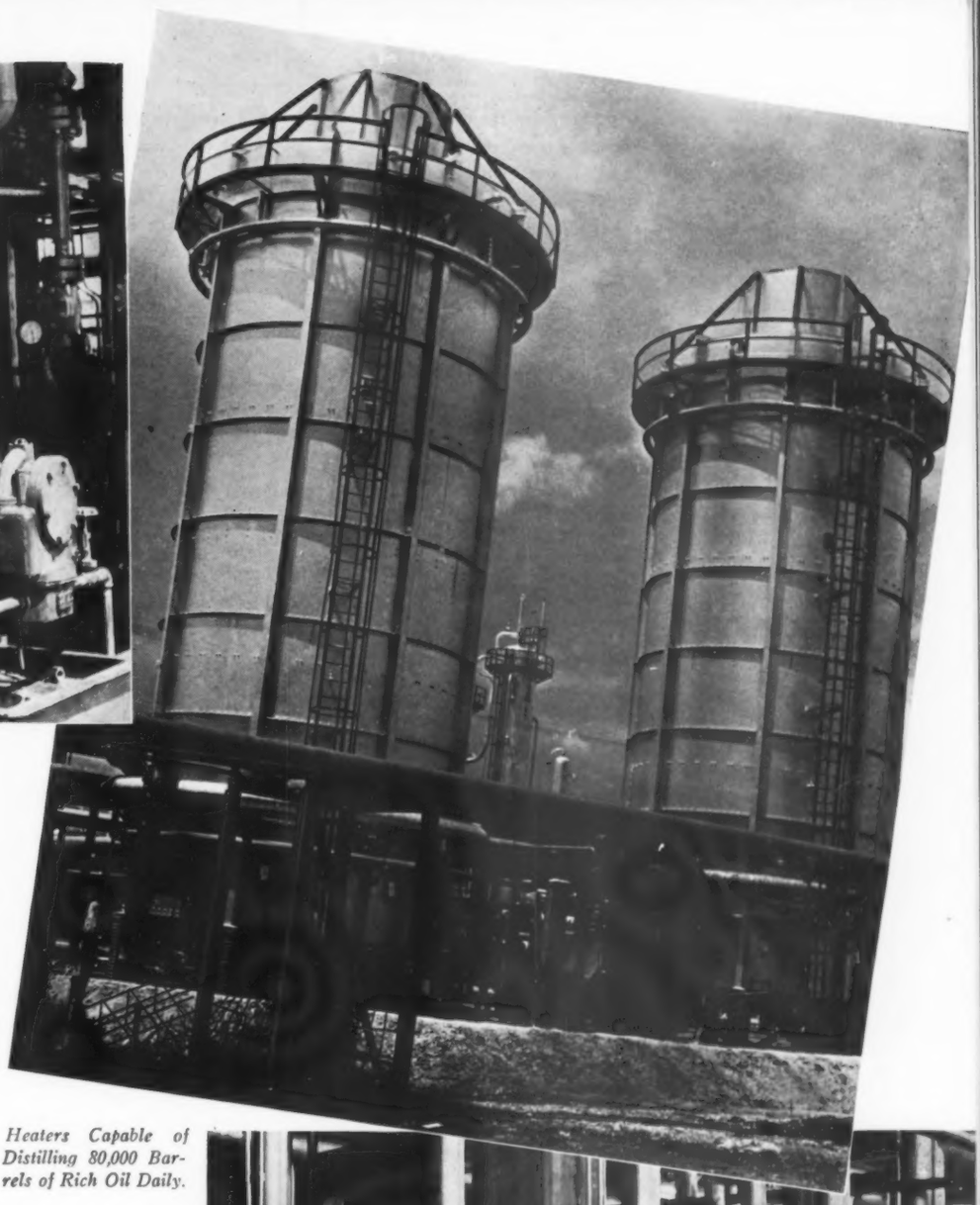
By far the greatest part of this type of development and plant construction has been in the Texas-Louisiana Gulf Coast Area. There are, however, a few high pressure recovery plants on the West Coast.

Originally, when a high pressure distillate field was discovered the wells were flowed into high pressure separators wherein the light oil or distillate was separated from the gas and the gas either burned in the air or compressed back into the formation. The separators were operated in most cases, where the gas was returned to the structure, at maximum pressure in order that the gas could be delivered to the compressor suction at a high pressure, thus reducing the number of compressors necessary. Since most of these separators operated in the retrograde condensation range, above 1100 pounds per square inch, considerable amounts of pentane and heavier material remained in the gas and was either burned or returned to the formation. Because of this, and also because in recent years there has been increasing demand for isopentane and iso and normal butane, recovery plants operating at high pressures have been built to handle the gas leav- the separators. At first these plants were designed to recover substantially all of the hexane and heavier material, about 90 percent of the pentanes, and only 40 to 50 percent of the butanes. Today, however, there are a few plants which are recovering as high as 90 percent of the normal butane in the incoming gas at pressure as high as 2250 pounds per square inch gauge.

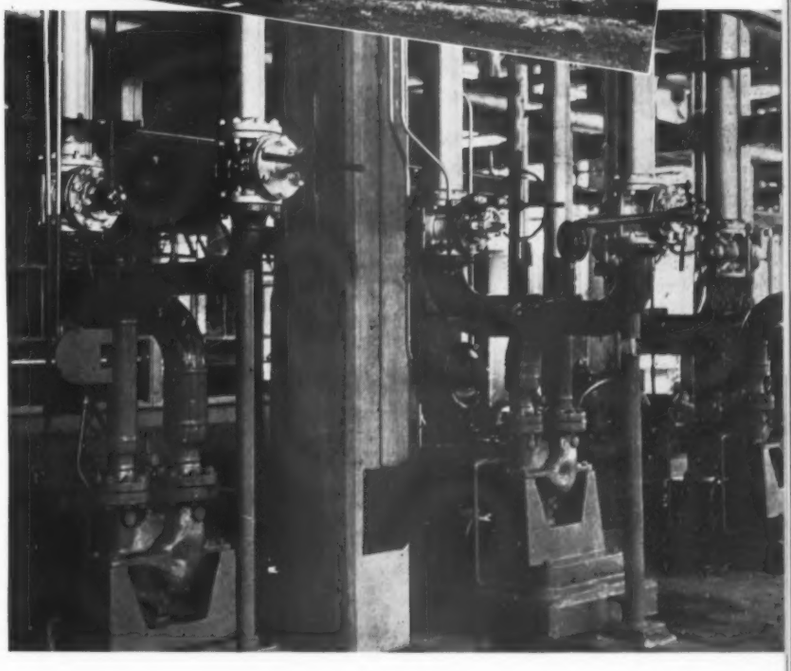
Within the last year the J. F. Pritchard and Company have designed, constructed, and put



*High Pressure Lean Oil Pump.*



*Heaters Capable of Distilling 80,000 Barrels of Rich Oil Daily.*



*Reflux Pumps.*

into operation for the J. S. Abercrombie Company and the Magnolia Petroleum Company, the largest single high pressure absorption plant ever built. This plant was designed to handle 350,000,000 cubic feet per day of wet gas from the Old Ocean Oil Field, near Sweeny, Texas.

The gas is gathered at various points throughout the field and delivered to the plant at 2250, 1250, 500, 150 and 50 pounds per square inch. The plant recovers 90 percent of the normal butane and substantially 100 percent of the isopentane and heavy material, producing liquid propane, isobutane, normal butane, isopentane and deisopentanized gasoline. When the light oil from the Old Ocean Field is charged to the plant, along with the various gases, the plant will produce besides the above products, a specification kerosene and light gas oil.

The various dry gases from the absorption plant are either sold or reinjected into the producing formation at 3,700 pounds per square inch.

Some idea of the size of the plant may be had from the lean oil circulated which is 80,000 barrels per day and the cooling water requirement of 17,000 gallons per minute.

A schematic flow diagram for the plant is given. Reference to this flow diagram will show that the absorption side of the plant differs from the conventional absorption systems in two instances. First, the high pressure absorbers utilize a double lean oil system. The advantages of this type of operation are discussed later. Second, the rich oil from the bottom of each absorber flows directly into the bottom of the next lower pressure absorber without intermediate flashing or separation.

The lean oil stripping system consists of three stills. A high pressure still operating at substantially 200 pounds per square inch, wherein the preheated rich oil from the absorption side of the plant is flashed and partially stripped of the lighter hydrocarbons. An intermediate

pressure still operating at 50 pounds per square inch, wherein the partially stripped rich oil is further stripped to produce a light low molecular weight lean oil as a bottoms product together with a raw gasoline overhead product. This raw gasoline is pumped as a liquid into the overhead from the high pressure still to help condensation at this point. Finally, a low pressure still operating at substantially atmospheric pressure for processing a small amount, about 15 percent, of bottoms from the intermediate pressure still to further strip and produce a heavy high molecular weight lean oil.

The use of a high pressure still in conjunction with the intermediate pressure still has the advantage over the conventional method of stripping which is to flash the preheated rich oil directly into a still operating at intermediate pressure of between 50 and 80 pounds, in that the combination of the two stills produce considerable less overhead gas which must be recycled and reprocessed in the absorption system to maintain an over-all high butane recovery. In a plant as large as this one and where the butane recovery is as high as here, this recycle gas is of sufficient magnitude so that if the process design is not such to keep it at a minimum, considerable additional plant investment will be required.

The raw gasoline from the lean oil stripping system is processed in a conventional manner. First, through a depropanizer, and then a debutanizer. The butane overhead from the debutanizer goes to the isobutane fractionator. The debutanized gasoline from the bottom of the debutanizer flows to the isopentane fractionator. The design pressure on the depropanizer has been set at approximately 350 pounds in order that a liquid propane can be withdrawn from the top of the tower.

Reference has been made to the double lean oil system used on the high pressure absorbers. The advantage in using this flow instead of the conventional single lean oil flow is that for a specified recovery an appreciable smaller amount of lean oil is circulated in the double oil system, and the lean oil that is circulated is considerably easier to prepare.

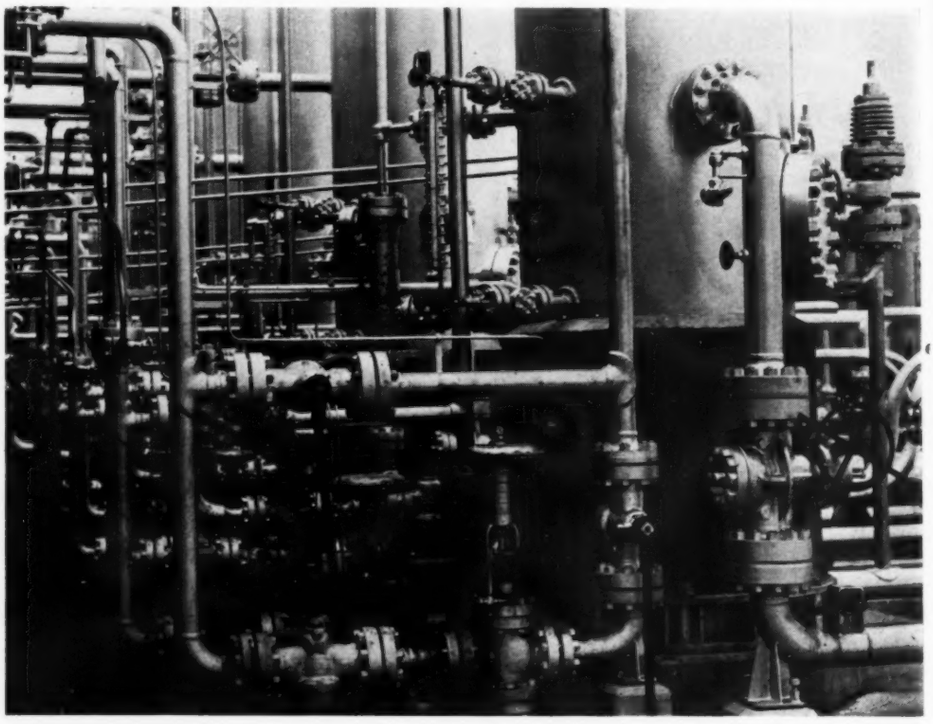
It is essential when absorbing in the retrograde condensation range to use a heavy high molecular weight lean oil having a high initial boiling point, in the neighborhood of 450° to 500°, otherwise there will be a considerable lean oil loss in the dry gas. The higher the absorption pressure, the more pronounced this loss becomes.

This heavy oil is, however, not as efficient an absorbing medium as a lighter oil because more pounds of the heavy oil have to be processed per mol used, and the same number of mols of either the light or heavy oil would have to be circulated for a specified recovery.

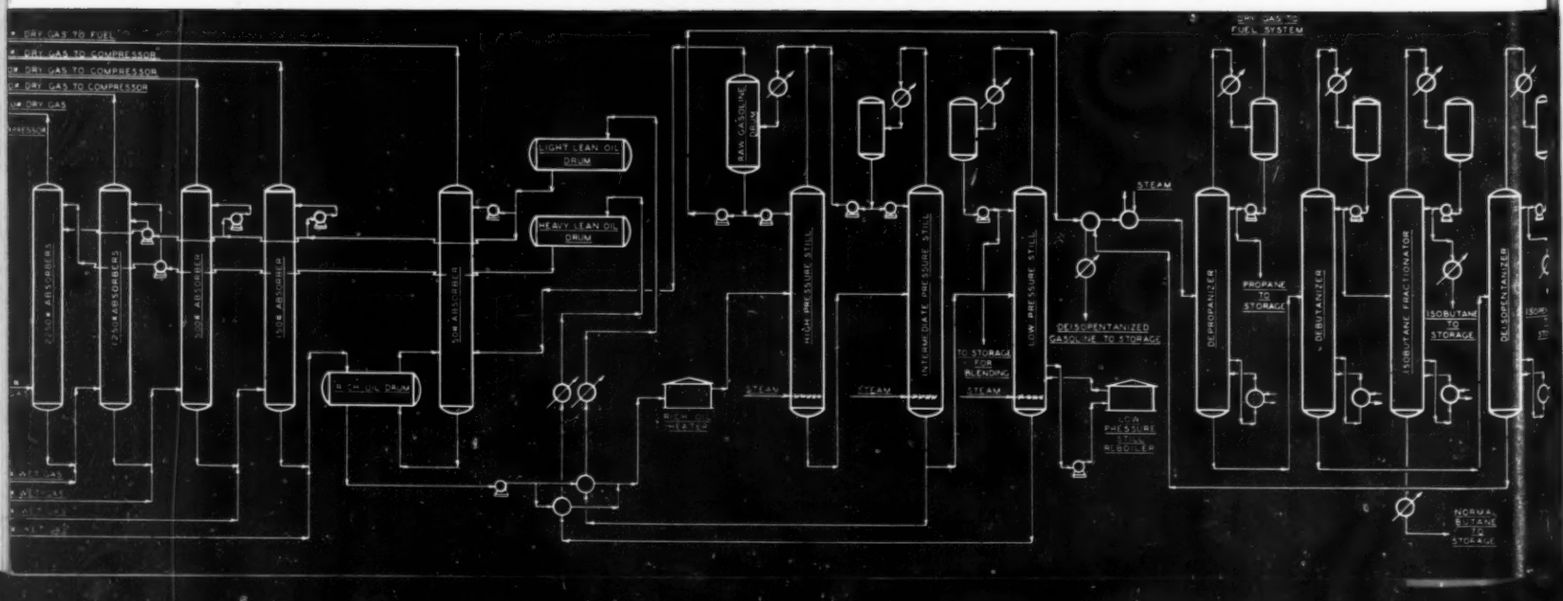
In the double lean oil system practically all of the absorption is carried out with light lean oil which is introduced into the absorbers two-thirds of the way up the absorbers. Heavy lean oil is introduced at the top of the absorbers and its function is to absorb the light lean oil in the dry gas coming from the lower section of the absorber.

The disadvantage of the double oil system is that it complicates to some extent the plant, both from an equipment standpoint and an operating standpoint. Check estimates have shown that on a plant the size of the one described here, there is no question but that this complication can be justified in a very material reduction in the plant costs. There is considerable question whether or not enough savings can be effected in a plant processing 75,000,000 cubic feet per day or less, unless the absorption was carried out at very excessive pressures where it might be necessary to prepare a special lean oil for use in the high pressure absorbers.

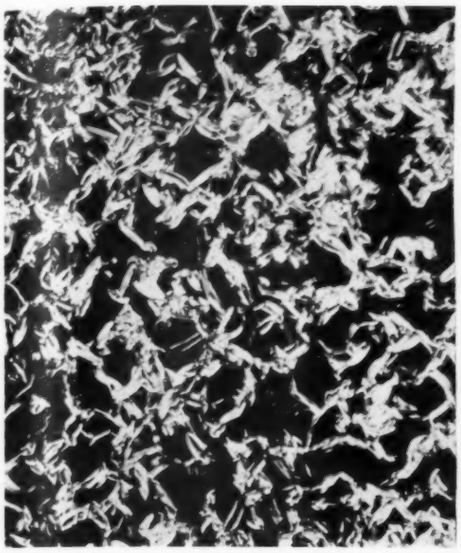
*Piping Around Absorbers Requires a Multiplicity of High Pressure Valves and Fittings.*

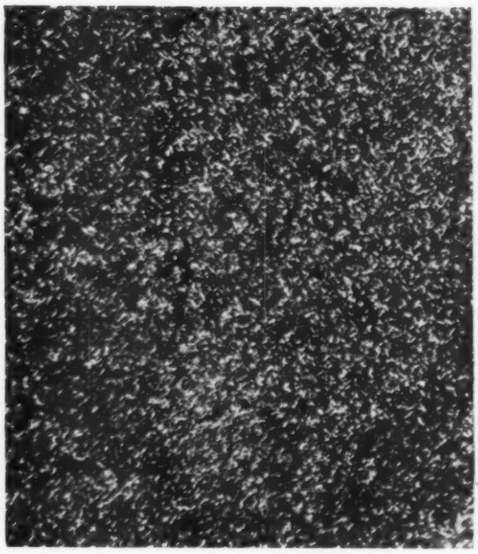


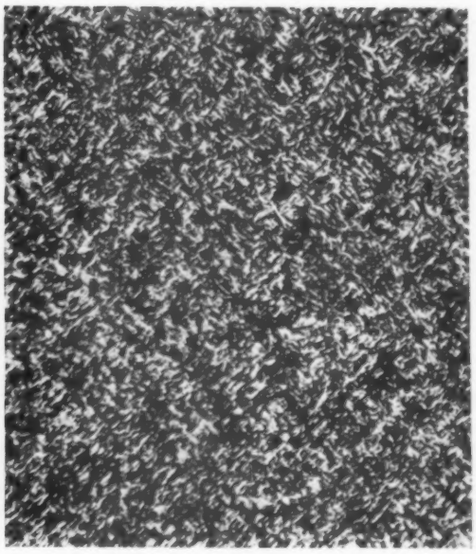
*Flow Chart Showing Double Lean Oil System and Continuous Flow of Oil from Higher to Lower Pressure Absorbers.*



# MANY NEW USES FOUND FOR PETROLEUM WAXES







*Left: Fig. 1—Photomicrograph of 122° F. Melting Point Fully Refined Paraffin Wax.*

*Center: Fig. 2—Photomicrograph of 155° F. Melting Point Microcrystalline Wax.*

*Right: Fig. 3—Photomicrograph of Blend of 90% of 122° F. Paraffin Wax (Fig. 1) and 10% of 155° F. Microcrystalline Wax (Fig. 2).*

**R. B. Killingsworth**

*Technical Service Laboratories, Socony-Vacuum Oil Company*

TODAY a great deal is being heard about the application of microcrystalline waxes in the military packaging program, particularly for the protection of ordnance parts from corrosion during overseas shipment and field storage and also in the packaging of the Army's field rations containing dehydrated foods. The microcrystalline waxes are of extreme importance to the success of this program and early in the war they were put under government allocation to direct the flow of production of these waxes into the most essential end uses. At the beginning of the war petroleum industry was converting only a small percentage of its raw materials into microcrystalline waxes. However, through the efforts of the Petroleum Administrator for War in urging the petroleum industry to utilize all available capacity not required for dewaxing lubricating oils for manufacture of microcrystalline waxes, their production was increased tremendously almost overnight. It is estimated that around 120,000,000 pounds of these waxes were produced last year as compared to approximately 20,000,000 pounds in 1939.

It is worthwhile noting that all this publicity on microcrystalline waxes is focusing attention on the slow but steady growth of petroleum waxes from their status at the beginning of the twentieth century as troublesome by-products of petroleum refineries to their present position as important basic industrial raw materials. Today their uses are so varied and numerous that it is difficult for one during the course of an average day not to come in contact with an article of clothing, furniture, container or foodstuff that has been treated with wax in one form or another. The struggle to develop industrial outlets for waxes through development of special waxes and practical methods of application is an interesting chapter in the history of the petroleum industry.

When the petroleum industry found that efficient lubricating oils could be made from the residue left in the stills after kerosene and gasoline were taken off by fractional distillation of crude oil, it was observed that these lubricants had a definite shortcoming. When the temperature dropped the oils became thick and sluggish. Investigation disclosed that there were two substances in the oils that needed to be removed. In the lighter oils there was a crystolline wax, known as paraffin wax, and in the heavier oils there was a gummy material which was very difficult to separate from the oil. By cold settling this gummy material could be removed, however, along with a considerable quantity of oil and in this form it was known as petrolatum or petroleum jelly. Because it was fairly easy to filter off the crystalline wax from the light oils when chilled, and to further refine it by a process known as "sweating" which removes essentially all the remaining oil in the wax, paraffin waxes have long been produced from petroleum for use in manufacture of candles and matches, the two largest and most important early applications. Small quantities of petrolatums were decolorized and employed as vehicles for salves and ointments. There were other minor uses of petrolatum but much of it was burned in the furnaces of refineries because the supply was much greater than industry's needs for it.

Today, paraffin waxes are generally obtained from paraffin or mixed-base crudes by cutting out a fraction known ar paraffin distillate under carefully controlled conditions to insure maximum quality of the wax contained therein. The paraffin distillate is then chilled and passed through filter presses where a slack wax containing up to 50 percent oil is separated. Most of the slack wax is still being refined by the "sweating" or fractional fusion method wherein wax is melted and pumped onto the surface of water in a series of pans having perforated bottoms, solidified by cooling the water and then, by drawing off the water, dropped on the perforated screens. As the temperature of the air surrounding the pans is slowly raised the oil and low melting waxes drain from the wax cake through the screen and is thus removed. This procedure is contained until a desired melting point of the wax cake is obtained when the temperature is quickly raised so that all the wax melts and is drawn off. At this stage it is known as crude scale wax. One sweating is usually not sufficient to obtain an efficient separation so a complicated system of recycling and resweating is employed as a general practice in producing the fully refined paraffin waxes of low oil content. After final sweating the waxes are usually filtered through clay to obtain a water white color and often an acid treatment step is introduced at some point in the operation to further improve the purity of the final product.

The use of solvent deoiling of slack waxes is becoming important chiefly due to the greater

*Above: A Gear is Wrapped in Paper Impregnated with Microcrystalline Wax.*

*Right: The Wrapped Gear is Dipped in Molten Microcrystalline Wax.*

flexibility and manufacturing control possible with this procedure.

Crude scale waxes and fully refined waxes are available in a wide variety of melting point grades, ranging from 118°F. to 136°F., the more important being the 122-124°F. and 130-133°F. EMP grades. In 1940 over 500,000,000 pounds of paraffin waxes were produced in the United States, of which about 350,000,000 pounds were consumed domestically. During the war years domestic production and consumption have increased greatly.

The removal of petrolatum from residual lubricating stocks is very difficult because of the minute size of the wax crystals formed in high viscosity oils and their great affinity for oil. The inefficiency of the "cold settling" process has given way to the solvent dewaxing method wherein the waxy oil is dissolved in a mixed solvent usually benzene and a ketone (acetone or methyl ethyl ketone), chilled and the wax removed by filtration on rotary vacuum filters. Even by this procedure fairly large quantities of oil are removed with the wax so that on elimination of the solvent by distillation a soft petrolatum remains. However, by selection of crudes, by variation of solvent-oil ratios or by variation of temperatures of dewaxing, a wide variety of petrolatums with respect to melting point and penetration may be produced. Many of these special petrolatums are finished by steaming and clay filtration for use in specialized industrial applications.

The most important use for petrolatum, however, is as a source for the microcrystalline waxes. They are produced from petrolatum by a second fractional crystallization or deoiling operation. Usually the same type of solvent employed for dewaxing lubricating oils is used and the wax is removed from the chilled solvent-petrolatum mixture either by filtration on rotary vacuum filters or by centrifuging. Again selection of charge or variation in solvent-petrolatum ratios and temperatures of deoiling allow the production of microcrystalline waxes of almost any desired melting point and penetration. Further, they may be finished by clay filtration to light colors. Because of this flexibility in production, the grades of microcrystalline waxes available on the market today are not as standardized as those of the paraffin-type waxes and have resulted largely from the demands of consumers but also to some extent from convenience of production.

The conventional refined paraffin waxes are hard, brittle, non-tacky, colorless and crystalline in structure. As mentioned before, they normally range in melting point from 118°F. to 136°F. On the other hand, the microcrystalline waxes are tough, ductile, tacky, colored (yellow to brown) and, as their name implies, microcrystalline in structure. They range in melting points from 140°F.-175°F. and sometimes even higher. The difference in crystalline structure between the paraffin and microcrystalline waxes is strikingly shown in the photomicrographs of Figures 1 and 2. An important property of microcrystalline waxes is their ability to suppress the crystall size of the paraffin type waxes. This is illustrated in Figure 3, a photomicrograph of a blend of 90 percent of the wax of Figure 1 and 10 percent of the microcrystalline wax of Figure 2.

All petroleum waxes are excellent water repellents and thin unbroken films of both types of waxes effectively resist the penetration of water vapor. It is on this property that practically all their industrial applications are based. As will be seen in the following descriptions of the major uses of petroleum waxes as processing materials, however, their widespread application depended on the development of waxes with physical properties designed for optimum performance in each general type of use.

Probably 80 percent of the paraffin-type waxes consumed in this country today is used in the treatment of paper to render it water repellent or moisture-vapor resistant. The largest and most important example of this use is the familiar breadwrapper which is a light opaque paper

coated on both sides with paraffin wax. By quickly chilling the molten wax after application a glossy, colorless film is obtained which in addition to being relatively impervious to water vapor is attractive in appearance and thus has sales appeal. Another important property of the wax for this use is its sealing strength since the ends of the wrapped loaf of bread are sealed by applying a hot iron to the folds of the waxed paper and chilling to bond the overlapping ends with wax. Paraffin waxes for breadwrapping papers are therefore processed for maximum sealing strength, gloss and gloss retention properties.

A second major use of paraffin waxes on paper is for the coating of paper milk containers. In this case the entire container is dipped into molten wax and, after proper draining to obtain uniform distribution, the wax is set by a blast of cold air.

Butter cartons, cereal boxes and a wide variety of papers are coated with paraffin waxes for use as package wraps to protect the contents from moisture. Wax impregnated papers are used where moisture vapor resistance is not essential and where water repellency is sufficient. Examples of these are "butcher's wrap", dynamite containers and soda straws.

In the form of emulsions, where the wax has been mechanically dispersed in water with the aid of emulsifying agents, paraffin waxes are used in both "beater sizing" and "top sizing" of paper. In "beater sizing" the wax emulsion is usually mixed with resin soap and added during the formation of the sheet, thus serving as a surface coating and bonding agent for the individual paper fibers. Paper so sized is slightly water repellent which decreases its tendency to curl under humid conditions and regulates its ink absorption properties. In "top sizing" the wax emulsion is applied to the finished sheet to obtain a light water repellent finish.

The chief disadvantage of paraffin waxes as paper coatings is their brittleness, particularly at low temperatures. When packages coated with paraffin waxes are exposed to temperatures around 0°F. the coatings are likely to crack or flake off, thus destroying the moisture resistance of the film. Even at higher temperature the paraffin wax films are easily broken by the rough handling packages receive during shipments. Microcrystalline waxes do not have this deficiency. In fact, microcrystalline wax films may be flexed at low temperatures without a sign of fracture and it is this characteristic which has opened a new field for wax coating in paper packaging.

The most important application of microcrystalline wax today is for the packaging of ordnance spare parts for overseas shipments to protect them from corrosion due to moisture. Early in the war, ordnance material reached the fighting fronts injured or even ruined by rust. It was found that by dipping the parts in a rust preventive, wrapping first with a greaseproof paper, then with a microcrystalline wax laminated and coated paper, and finally dipping the wrapped part in molten microcrystalline wax, the parts could be protected satisfactorily under the severe conditions encountered in the prosecution of a global war. It was primarily to protect the supply of microcrystalline waxes for this application that they were placed under government allocation. Other military packaging applications of microcrystalline waxes are for the coating of the Army's field ration and dehydrated egg containers. In these two cases the microcrystalline wax is blended with an equal part of paraffin wax to obtain a coating which is nontacky yet sufficiently ductile to meet the requirements. A similar blend is suitable for coating cheese and packages for frozen foods.

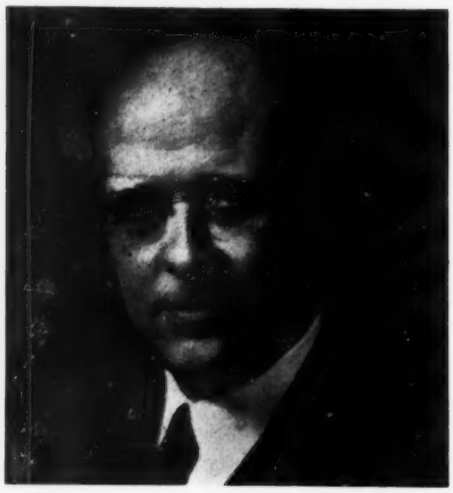
*Microcrystalline Wax Protects Field Ration K—Supper Unit*

In packaging, increasing use is being made of wax laminated paper—sheets of paper or paperboard bonded together with microcrystalline wax. Because of tackiness and toughness microcrystalline waxes are excellent laminants and by combining a paperboard for strength, microcrystalline wax for moisture resistance and a greaseproof paper for protection against fats and oils, a superior wrapping or container for food stuffs may be produced.

Paraffin and microcrystalline waxes have thousands of uses other than those listed above for the paper industry. The popular novelty candles have been made possible by proper combinations of paraffin waxes with other waxes such as vegetable or microcrystalline waxes.

Large quantities of military fabrics, such as shelter tent duck and mosquito nettings, are rendered water repellent by impregnation with wax emulsions. Tarpaulins and canvas water tanks are rendered waterproof by impregnation with combinations of waxes and pigments. The electrical industry makes good use of high melting microcrystalline waxes in protecting capacitors, cables and other products against moisture. Microcrystalline waxes are also used in the manufacture of printing inks, wax polishes and cosmetics, replacing beeswax efficiently and at lower cost. They are used for lining of beer cans, drums and tanks for shipping and storage of corrosive liquids such as acetic acid, wine and vinegar. Even hydrofluoric acid which etches glass does not attack petroleum wax and this is made use of in the etching industry. The electrotyping industry has found that microcrystalline wax can replace ozokerite, an imported natural wax, in making electrotyping impression plates. The rubber industry uses petroleum waxes to protect rubber surfaces from drying out and cracking due to sunlight. The ceramic industry uses wax emulsions as binders in manufacturing complicated molded ceramic insulators. There are a host of other uses—many of them demonstrated in many industries and many more waiting only the day of final victory to prove their worth.

# Oil Company Staff Changes



*R. J. Saunders*

*Bob Dunn*

**R. L. SAUNDERS,** vice president and secretary of The Texas Company, will head the domestic sales organization succeeding H. W. Dodge, whose resignation has been announced. Walter Hochuli, sales manager of the company's central territory, was appointed general sales manager when he left government service on September 1. Mr. Hochuli was director of the Distribution and Marketing Division and chairman of the Domestic Operating Committee of the PAW at the close of the war.

Mr. Saunders entered the service of The Texas Company in 1909 as clerk in the sales department. He became assistant general sales manager in 1935. In June, 1938, he was elected secretary and in April, 1944, was elected a vice president while retaining his duties as secretary. In assuming his new duties Mr. Saunders will resign as secretary of the company.

Mr. Hochuli started with The Texas Company as a salesman in Morristown, New Jersey, March 16, 1924. He was transferred in 1931 to Indian Refining Company as assistant manager and later manager. He returned to The Texas Company in 1934 as assistant territorial manager in charge of the Central Territory and was promoted to manager in 1938. He has been on leave from The Texas Company to the Petroleum Administrator for War since April, 1943.

**MARTIN A. McNULTY** has succeeded C. T. Bergeson as comptroller of Standard Oil Company (Indiana). Bergeson had been with Standard nearly thirty years at the time of his resignation. McNulty also has nearly thirty years of service behind him, having taken a job as office boy in 1916. His promotion is from the position of assistant comptroller.

**BOB DUNN,** northeastern district sales manager, has been named assistant to the general sales manager of the Macmillan Petroleum Corporation's Ring Free oil division. He will make his headquarters at the company's New York office in Rockefeller Center.

H. C. Akerberg, recently appointed general sales manager of the Ring Free oil division, will move to the Los Angeles headquarters. James A. Edwards, former president of the Jesco Lubricant Company of Kansas City, Mo., was appointed sales manager of the grease department. He also will make his headquarters at Los Angeles.

**PAUL C. SHEA,** vice-president of the Colonial Beacon Oil Company, has been named by The Carter Oil Company as acting manager of manufacturing for Carter's Northwest Division. He replaces T. J. Landry, who resigned from Carter in June, 1945, to become a Carter marketing distributor at Kalispell, Mont. For a number of years Shea has been in charge of manufacturing for Colonial Beacon, with headquarters at Everett, Mass.

At the same time, T. R. Corbett was selected as assistant manager of manufacturing for Carter's Northwest Division. Since May, 1944, he has served as Carter's chief refining engineer, Northwest Division and previously was chemist and engineer for Yale Oil Corporation before it was purchased by Carter.

A third change is the appointment of R. D. Sloan, formerly head of the company's scouting and statistical division in Tulsa, as division geologist for Carter's Northwest Division to succeed D. L. Blackstone, who is leaving Carter to return to the University of Missouri as associate professor of geology.

**ELECTION** of Bushrod Brush Howard to the board of directors of Standard Oil Company (New Jersey) has been announced by Ralph W. Gallagher, chairman of the board. He becomes the eleventh director, following the recent retirement of Wallace E. Pratt.

Mr. Howard is widely known in the shipping world, having been associated with Jersey's large tanker fleet since he joined the company in 1920. He has been general manager of Jersey's marine group throughout the war period. A blue-water man from birth, Mr. Howard was born in 1889 in the Naval Academy at Annapolis, where his father, Admiral Thomas Benton Howard, was stationed. Graduating from the Naval Academy in 1911, he remained in the Navy throughout World War I, leaving the service in 1919 with the rank of Lieutenant Commander. Two brothers, A. C. Howard and Douglas L. Howard, deceased, were also Naval Academy men.

Joining the Jersey Company's marine operating division in 1920, Mr. Howard served in various posts. He became managing operator of Societe Auxiliare de Transports in 1925 and later director of l'Economique and Bedford Petroleum Company, French affiliates with headquarters in Paris. In 1929 Mr. Howard went to London to coordinate marine operations in the European area for Jersey's Standard Shipping Company, returning to the United States in 1934 to become assistant manager of marine operations.

In 1941, at the request of the British Board of Trade, Mr. Howard went to England as Admiral Land's representative to expedite tanker turnarounds in British ports and speed up deliveries of vitally needed oil from the United States. His study of British facilities for discharging vessels brough about improvements which were important to the war effort. In the following year Mr. Howard went to India and the Suez area as a representative of the War Shipping Administration, on the British-American mission organized to expedite cargo movements involving all

*Bushrod Brush Howard*

types of war materials flowing to India and the middle east.

Mr. Howard is president of War Emergency Tankers Inc., operator of government-owned tankers for the War Shipping Administration. He is a member of the board of managers of the American Bureau of Shipping and a director of the National Federation of American Shipping and the American Merchant Marine Institute.

C. S. **TEITSWORTH,** vice-chairman of the manufacturing committee of Socony-Vacuum Oil Company, Inc., for the past first years, has been made chairman of that committee. He succeeds W. F. Burt, who has been made a vice-president and a member of the executive committee.

Mr. Teitsworth has been associated with Socony-Vacuum and affiliated companies for 19 years. Before transferring to the New York office of the company in 1934, he was associated for eight years with the General Petroleum Corporation, Los Angeles, Calif., where he was supervisor of process laboratories.

Prior to 1926, when he joined General Petroleum, Mr. Teitsworth was associated with the American Potash and Chemical Company, Trona, Calif; Fixed Nitrogen Research Laboratory of the War Department, Washington, D. C.; the Celite Company, Lompoc, Calif., and the Dicalite Company, Los Angeles, Calif.

At the time of his transfer to New York in 1934, his specific assignment was to evaluate the commercial possibilities of catalytic cracking in Socony-Vacuum's refineries. He has been intimately associated with the development and commercialization of catalytic cracking since that time and is a director of the Houdry Process Corporation. In 1936 he was appointed to the manufacturing committee as manager for the company's mid-west refineries.

*C. S. Teitsworth*

*Carl E. Cummings*

**CARL E. CUMMINGS** has been named to succeed the late Allan V. Ritchie as superintendent of Texaco's research laboratory at Beacon, New York. Col. Cummings was released late in August by the United States Army, which he recently served as deputy chief petroleum supply officer for the European theater of operation.

Col. Cummings entered the service of the Texas Company in 1923, after being graduated as a mechanical engineer by John Hopkins University. He became chief engineer at Bayonne Laboratory in 1929, and in April, 1931, transferred to Beacon for engineering work in connection with construction. He later became engineer in charge of the engineering research department and then supervisor in charge of that department, which position he held when granted a military leave of absence in 1941.

Col. Cummings was a member of the Officers Reserve Corps, and entered service as a Captain. Before going overseas in 1943, he was deputy chief of engineers, Specifications Section Engineer's Branch, at the Tank an Automotive Center, Detroit. He was promoted to the rank of Colonel in 1944, and this year was decorated with the Legion of Merit for his part in supplying the armed forces in Europe with petroleum products.

**HERBERT WILLETTS** who has been assistant general manager of the eastern marketing division of Socony-Vacuum Oil Company has been advanced to the post of general manager. He succeeds John M. Martin who is retiring after forty-two years of service with the company.

**R. C. STONER** has been elected chairman of the board of the Richmond Petroleum Company of California. Norman Hardy is the new president. Richmond, a Standard of California subsidiary, currently is engaged in exploratory work in Venezuela and Colombia.

*R. E. Nagel*

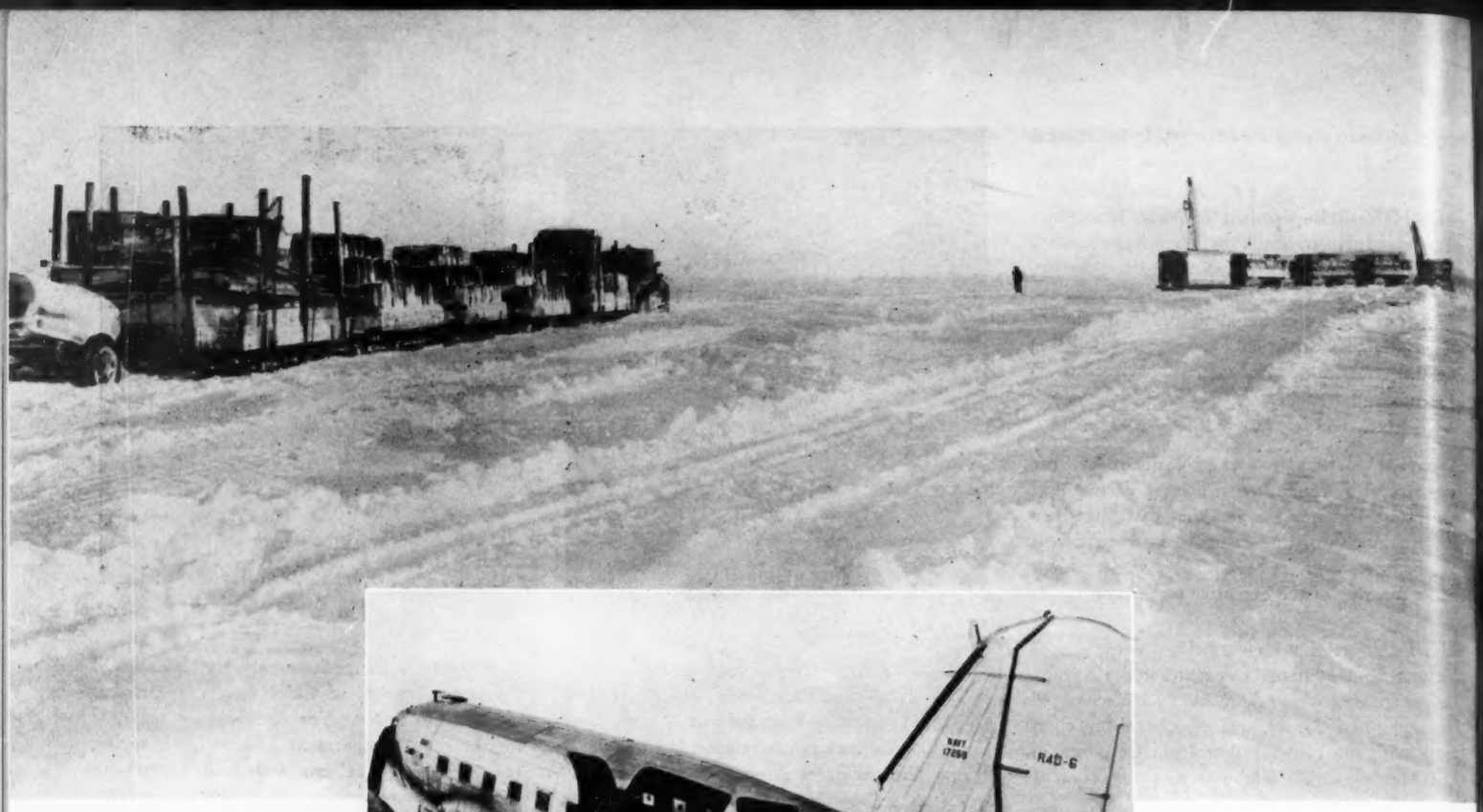
**R. E. NAGEL,** formerly with the Universal Oil Products Company of Chicago for 24 years, has been appointed New York district sales manager for the Fluor Corporation, Ltd. of Los Angeles. He served Universal as a draftsman, supervising construction engineer, superintendent of construction and operator on experimental and commercial thermal cracking units and in their research and development department. For the past twelve years he has conducted relations with various oil companies in the commercial development of refining processes and their problems.

**L. A. ("PAT") HENRY,** veteran pilot with 13 years of service with Standard Oil Company of Indiana, has been appointed manager of the company's aviation department.

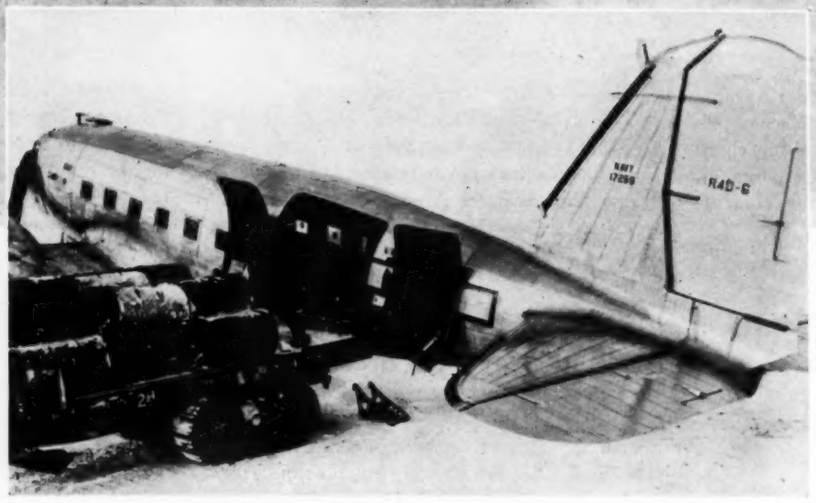
John P. Porter, Standard's aviation salesman for almost 20 years, has become airlines representative in the aviation department. Mr. Porter was one of the pilots when the company accepted delivery of its first plane on the same day that Charles A. Lindbergh landed in Paris in 1927.

**DAVID L. GORDON** of Houston, has been elected a vice president of Anchor Petroleum Co., Tulsa. He will continue to maintain his offices at Houston where he has represented Anchor for a number of years.

**RICHARD V. LeSUEUR,** chairman of the board and president of Imperial Oil Ltd. and of the International Petroleum Company, Ltd. died at his home in Toronto, Canada on September 6. Mr. LeSueur was born in Sarnia, Ontario, in 1881. He was educated for the law but early became interested in petroleum and for many years had been prominently identified with oil development in Colombia, Venezuela, Ecuador and Peru as well as in Canada. He became the executive head of the Imperial and International Companies in 1944 succeeding G. Harrison Smith who retired at that time.



*Above: Bulldozers Serve as Locomotives for this Seabee Supply Train Moving Inland from Point Barrow, Alaska, to the Site of Drilling Operations.*




*Left: Planes Make Regular Trips with Lighter Supplies and Equipment. Landing on the Barren Snow is Easy.*

# NAVY PUSHING TESTS OF ALASKAN RESERVE

NAVY Seabees have effected an amphibious landing—not against the Japs this time but against Arctic ice—at Naval Petroleum Reserve No. 4 on the northernmost tip of Alaska. They landed more than 1,000 tons of heavy oilfield and runway construction equipment as well as fuel and provisions, and are now in the process of drilling a test well as a first step toward unearthing oil reserves which authoritative sources believe may be of immense value.

The expedition, which involves some 200 men, is in charge of Captain Bart W. Gillespie, Civil Engineer Corps, USNR, of California, who since his graduation from Stanford until his entry into the service in 1942 has had plenty of experience as an oil man in Peru, Bolivia, Argentina and Mexico. He was with the Army combat engineers in France in World War I.

Original authority for the project came from President Roosevelt. A special appropriation was provided by Congress, the sole object of which was to determine whether an area classified for 20 years as an oil reserve actually contains oil in quantity. Only a national emergency, the law states, will bring the Navy's Alaska properties under complete development.

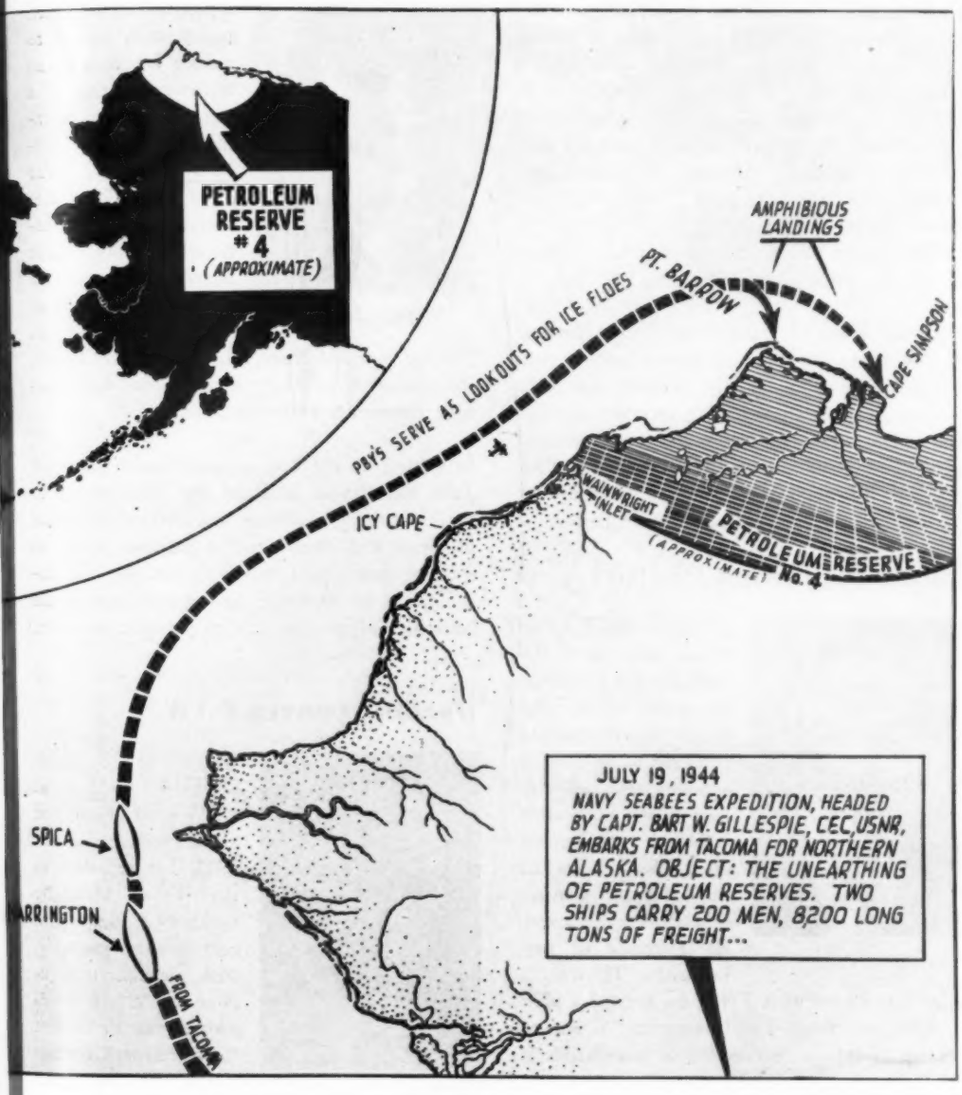
The Secretary of the Navy is the one to say whether such an emergency exists, and his findings then must be approved by the President for Congressional action. Navy says that if it should ever become necessary to explore or develop the Reserve on any significant scale, it will, in accordance with its established policy, call upon the private oil industry to do the work.

Naval Petroleum Reserve No. 4—commonly known as the Point Barrow reserve—covers 35,000 square miles. It extends from the northwest point of Wainwright, south to the Delong Mountains. From there it meanders to the Colville River on the east, and, thence, follows a northerly direction to the Arctic. For more than 50 years, according to Captain Gillespie, this region has given promise of oil. Point Barrow, the western beginning of the expedition proper, is only 1,100 miles from the North Pole, and the expedition had to establish itself on the Reserve within the six weeks of the "open" season, involving split-hair timing.

The expedition reached the ice fields ready for a year's seclusion. LCM's and pontoon barges, the latter husky, sturdily built and self-propelled, took the men and their equipment ashore. The unloading had to be done some three miles offshore in shifting ice. It encountered fog but time was too precious to wait for favorable weather. An airstrip was begun immediately to provide air communication with the outside before September ice-locked the Arctic. A camp was established with warehouses to protect machinery against humidity and extreme temperatures. Geologists and drillers had previously determined the best sites for drilling the first well—at Umiat, on the Colville River, 180 miles from Point Barrow.

This proved one of the most desolate points in an isolated region, totally devoid of inhabitants.

It was to this point that the expedition's detachment had to make its way with its ponderous equipment. With bulldozers for locomotives, trains of tractor-sleds, snow-jeeps, and other ingeniously heated equipment, the strange, modern ice-caravan made its way to Umiat. The 180 air miles became a 331 mile trek. There had been strong and skeptical opposition to the expedition on the ground of its "impossibility". Actually three trips were made to get all the heavy equipment and supplies across the ice and through the Arctic blizzards.


PETROLEUM RESERVE #4 (APPROXIMATE)
AMPHIBIOUS LANDINGS
PT. BARROW
CAPE SIMPSON
PLYS SERVE AS LOOKOUTS FOR ICE FLOES
ICY CAPE
WAINWRIGHT INLET
PETROLEUM RESERVE No. 4
(APPROXIMATE)
SPICA
ARRINGTON
FROM TACOMA
JULY 19, 1944
NAVY SEABEES EXPEDITION, HEADED BY CAPT. BART W. GILLESPIE, CEC, USNR, EMBARKS FROM TACOMA FOR NORTHERN ALASKA. OBJECT: THE UNEARTHING OF PETROLEUM RESERVES. TWO SHIPS CARRY 200 MEN, 8,200 LONG TONS OF FREIGHT...

The drive to Umiat had been preceded by an 80-mile expedition to Cape Simpson, which because of oil seeps has been regarded as meriting the attention of scientists with geophysical instruments to determine the geological structure.

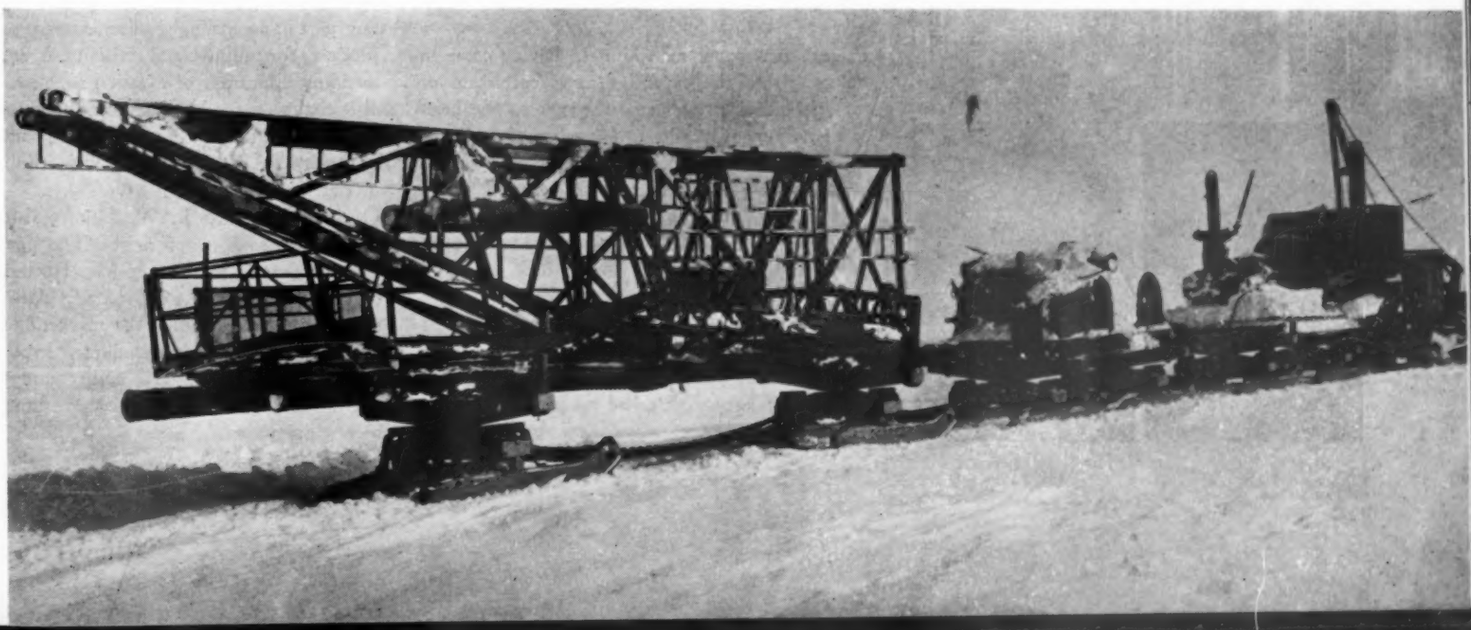
Today at Point Barrow there is every known aid to aerial operation and a plane can land there as easily, says Captain Gillespie, as at La-Guardia Field. All through the construction period the Seabees were assisted in building up radio aids to navigation by the Alaska Communications System and the Army Air Communication Service. Naval Air Transport has since taken over air-flights and is now handling all cargo movement into the Reserve.

"The entire operation from an oil man's viewpoint is logical," says Captain Gillespie. "It is based primarily on geological exploration, carried out by the Navy and approved by civilian Navy consultants. The presence of favorable geological structures and oil seeps containing oil of high quality and one which will permit handling at extremely low temperatres is in itself sufficient to justify investigation by any soundly-operated oil company.

"However, no further development will be done until the results of the drilling on Umiat Number One have been determined and the Director of Naval Petroleum Reserves shall have obtained further authority to continue exploring in Petroleum Reserve Number Four."

Preliminary surveys have been made for outlets so that the oil will move easily from its sources to convenient centers of distribution. These outlets, tentative map drawings show, would transmit the oil from Umiat clear across the back of Alaska, from the Arctic in the north, to the Pacific in the South. These outlets, Navy says, are proposed for installation only when oil deposits are sufficient to merit such a system.

*Sections of the Drilling Rig for the Alaskan Naval Reserve Tests were Pulled 331 Miles on Tractor Sleds.*



# ★ ★ ECHOES FROM THE WASHINGTON OIL FRONT ★ ★

**By W. J. Maddox,** *Chief of World Petroleum Washington Bureau*

*William R. Boyd, Jr.*

*W. Alton Jones*

## Oil Pact Mission

WITH Presidential assurance that he is secure in his Cabinet seat as long as he desires to retain it, Secretary Ickes has been able to turn his attention to a task that is dear to his heart —the completion of the Anglo-American oil agreement. Flanked by a strong delegation of oil industry representatives and department officials the Petroleum Administrator took off for London where the first meeting to discuss the revised treaty was held September 17. According to schedule the talks will be concluded in time for a return here early this month.

The Secretary's party included Deputy Petroleum Administrator Ralph K. Davies; Charles Rayner, head of the petroleum division of the State Department; John Loftus and Samuel Botsford; William R. Boyd, Jr., chairman of the Petroleum Industry War Council; A. Jacobsen, chairman of the oil policy committee of the Council; W. Alton Jones, president of War Emergency Pipelines, who has been an active figure in wartime operations of the industry; Joseph E. Pogue, economic advisor; Ralph T. Zook, president of the Independent Petroleum Association of America; George Hill, Jr., a leading figure among independent oil interests; C. Stribling Snodgrass, director of the foreign refining division of PAW; Robert E. Hardwicke of the legal division, and Gordon M. Sessions, former head of PAW's press department.

*Ralph T. Zook*

*George Hill, Jr.*

In inviting representatives of the oil industry to accompany him on his trip and to be present at the discussions in London Mr. Ickes made a move which has met with general approval as demonstrating again his desire to work out an international agreement that will have the support and approval of the nation's oil interests. Other members of the party were selected obviously because of their special knowledge of various phases of oil activity and their ability to supply information that may be helpful.

Secretary Ickes has maintained a keen interest in the Anglo-American agreement since it was first proposed. Undoubtedly, he feels that if he can bring the negotiations to a successful conclusion and put the organization of an international oil conference under way it will round out his record as director of petroleum activities during the war and the current readjustment period.

## Censorship Wins Praise

*Byron Price*

PRESIDENT Truman's selection of Byron Price as his personal representative in Germany to recommend what should be done in a public relations way during the occupation is hailed with general satisfaction. As head of the Office of Censorship, Price set up an enviable record of performance. It was a tough job, loaded with TNT, for keeping a pack of news and trade paper reporters — not to mention editors — eating out of your hands is no pleasant pastime. And it was all voluntary on their part.

Price, a newspaper man himself, having come to the job from the executive news editorship of the Associated Press, came through as one head of a government war bureau of whom there never was complaint or criticism. Theodore Koop, who is now sitting in Price's seat trying to liquidate Censorship's affairs by November 15, says the final score of the office was "no wilful violations" of the code.

Price says the secret of his success is he kept his mouth shut — and he is ready to toss the credit back at press itself. Censorship was one government agency that had no public relations staff to sing its praises or ward off attacks.

## Rubber Policy

*William L. Batt*

A definite step toward a post-war co-ordinated policy with regard to rubber has been taken with the creation of a top government committee headed by William L. Batt, War Production Board vice chairman for international supply. The board will consist of a member from each of seven agencies: State, Justice, War and Navy, Surplus Property Board, Reconstruction Finance Corporation, and Foreign Economics Administration.

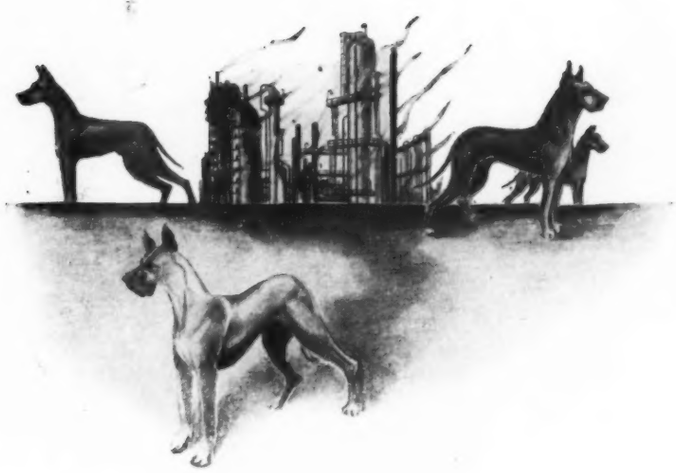
In setting up the board, Reconversion Director John W. Snyder outlined the functions as to survey natural, synthetic and reclaimed rubber problems and recommend a national policy to stabilize prices and supply, encourage the development of synthetic, and guard against the possibility of another crucial wartime shortage.

## Hochuli Leaves PAW

*Walter Hochuli*

WALTER HOCHULI, director of PAW's marketing and distribution since April 1943, has returned to the Texas Company in his new capacity as general sales manager, with headquarters in New York. As chairman of the Petroleum Requirements Committee, the retiring director played an important part in determing requirements for petroleum products for military and civilian uses and recommending allocation of aviation supplies. He was also chairman of the Domestic Operating Committee, which assured unified and co-ordinated action by PAW in working with the industry.

Of his work with PAW, Deputy Administrator Davies said in parting: "The government and the general public owe Mr. Hochuli a debt of gratitude for the exceptionally skillful manner in which he handled the marketing and distribution of petroleum products, despite severe wartime dislocations. His ability and devotion during his service with the government have been outstanding."



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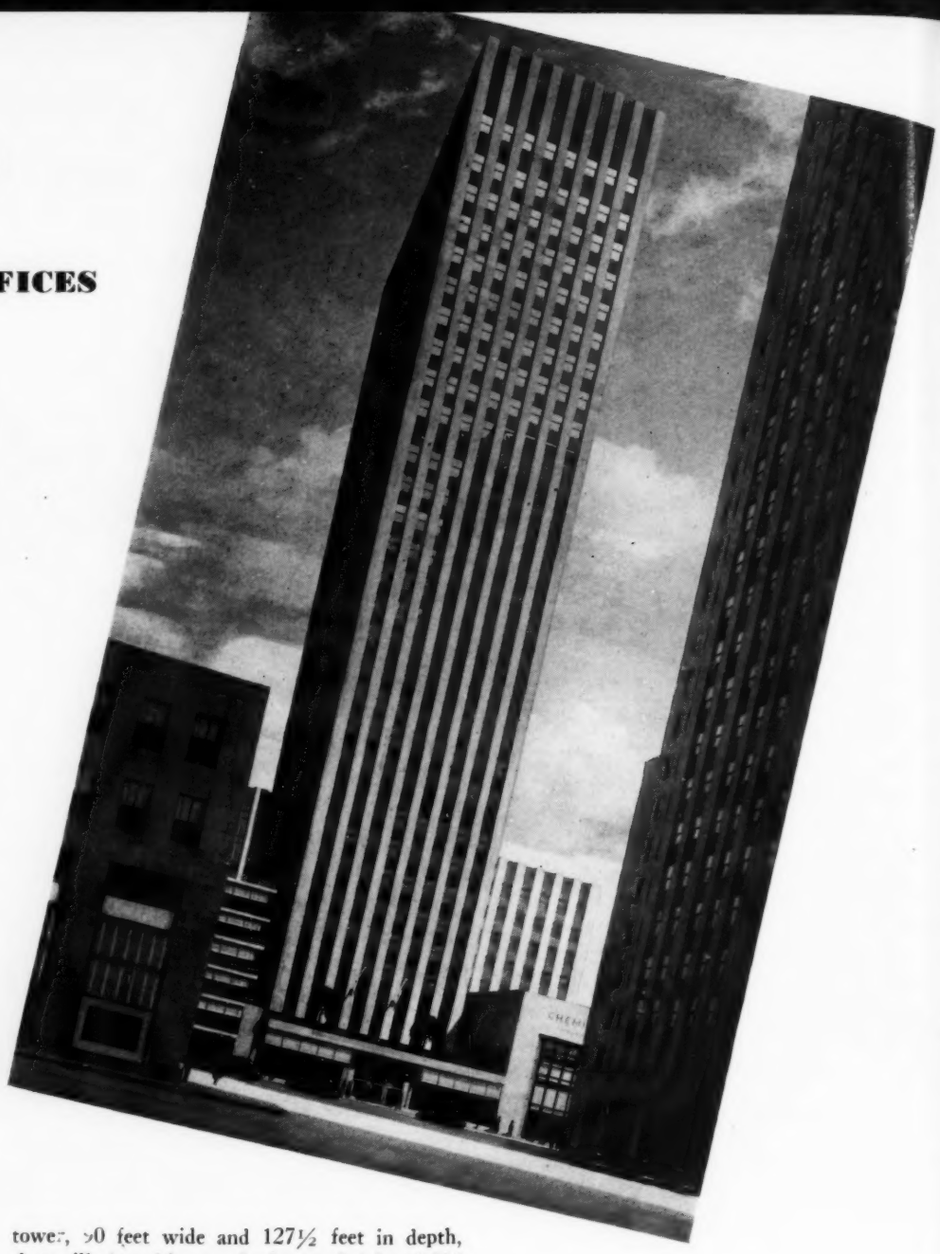
# NEW SKYSCRAPER WILL HOUSE JERSEY STANDARD OFFICES



SIGNALIZING the release of construction materials that has come with the close of the war, Standard Oil Company (N.J.) has announced that it will proceed with the erection of a new building in New York to house the home offices of the parent company and its various affiliates which are now scattered in various parts of the city. Plans for the new structure have been in preparation for a long time but their execution has been delayed by the ban on construction and on the use of materials during the war.

The new building will add another impressive unit to the collection of giant structures surrounding Rockefeller Center. It will occupy one hundred feet frontage on West Fifty-first Street, facing Rockefeller Plaza from the north and extending through the block to West Fifty-Second Street where it will extend a distance of 274 feet. Although not emulating the height of its lofty neighbors, the RCA building and the International Building, it will be of imppressive proportions, thirty-three stories in height and rising 424 feet above the sidewalk. It will be a single tower with no setback above the second floor and will be one of the first large buildings erected under the revised zoning regulations of New York City.

The 37,500 square-foot ground area for the T-shaped structure has been purchased in the name of The Haswin Corporation, a Rockefeller company. Plans call for the razing of sixteen four and five-story brownstone houses which have an assessed valuation of approximately $211,000 and which stand on land with a tax value of $945,000.

The proposed edifice, containing more than 350,000 square feet of rentable area, will cost approximately $6,000,000. Construction will begin as soon as materials are available and is expected to continue for a year. The Haswin Corporation has announced that the building is approximately 100 percent rented, the Standard Oil Company (New Jersey) having agreed to lease all office space above the second floor. It is expected that the term of the lease will be from completion of the construction of the building to late in 1962.

Jersey Standard officials have announced that the space will be used to consolidate offices now at six different locations throughout the city. Space in the neighboring RCA Building, now occupied by offices of the parent organization, will be retained.

The skyscraper, to be known as the Esso Building, will have a limestone exterior and a central tower, 90 feet wide and 127½ feet in depth, that will rise without setbacks to a height of 424 feet. Landscaped roof gardens will extend along both streets at the second floor level.

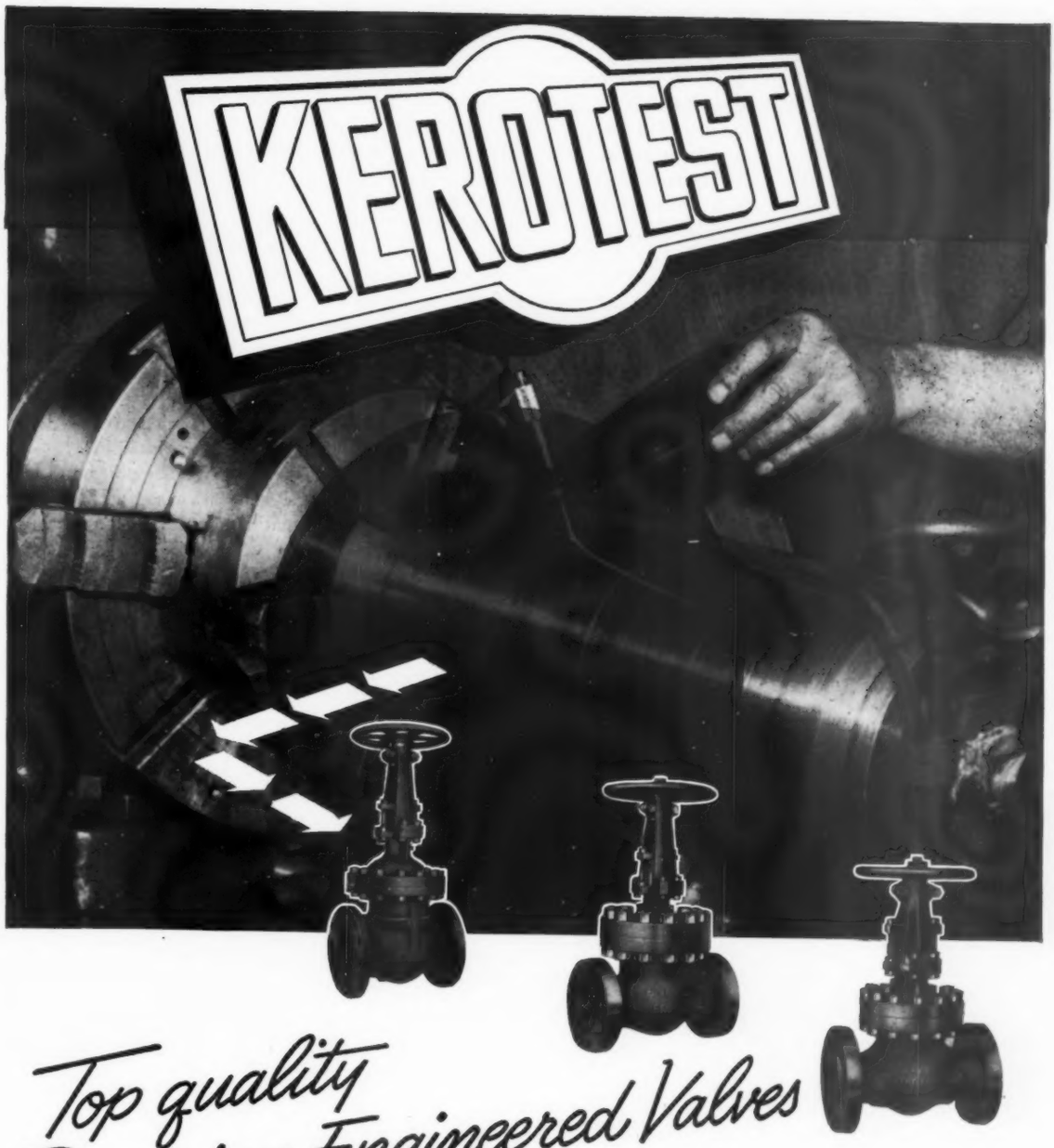
Connecting the two building entrances, on West 51st Street and West 52nd Street, will be a spacious lobby that will house an information and products display center of the Standard Oil Company of New Jersey. Plans also include the installation of a news stand and one or two service shops on the street floor level.

One of the largest restaurants in mid-town Manhattan will run through from 51st to 52nd Street on the west side of the lobby with dining rooms on two floors. The Chemical Bank & Trust Company has leased space on the street floor level which will provide the bank with an entrance on 52nd Street. The bank's footage on 52nd Street will be 64 feet more than its present frontage on 51st Street. The bank will also have an entrance in the Esso Building lobby.

In conformity with the new regulations governing buildings that cover 100 percent of the ground area, the plans call for interior loading and garage facilities for tenants. Eighteen elevators will service an estimated 3,000 workers.

Approximately 7,500 tons of steel will be used in the framework of the completely-fireproof edifice. Structural innovations and the newest building materials are being investigated for use in the new structure which will be the tallest New York City office building to be completely air conditioned.

Clearance of the site and razing of the sixteen out-moded buildings occupying the area that served as rooming houses, night clubs and restaurants, was begun months ago and the job is expected to be completed before the end of the year. A row of brownstone residences located in the space that the building is to fill on West 52nd Street have been torn down and a few weeks ago work began on the wrecking of three more 52nd Street dwellings. Demolition of the five remaining buildings on 52nd Street and the four buildings on 51st Street will proceed as soon as the premises are vacated.

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## Jersey Standard Expands Research Facilities

PLANS for two major petroleum research centers, construction of which will be started as quickly as steel and other materials are made available and to be completed late in 1946 or early 1947, have been announced by Eugene Holman, president Standard Oil Company (N.J.)

The program will provide scientists of Standard Oil Development Company, central technical organization of the Jersey Standard group, with the most modern and extensive research facilities in the oil industry anywhere in the world.

"The effectiveness of scientific research in protecting and raising the people's living standards and in opening new realms for human endeavor is one of the outstanding facts of our day", Mr. Holman said. "Free people everywhere have particular cause at this time to be grateful for the research carried out in the laboratories of our country during the past decades. From that research came the weapons that saved us from disaster and made possible the victory we are now thankfully celebrating.

"This nation, which contributed so much to the war, can contribute much to the building of the peace. To do so effectively will call for continued scientific achievement. Reconstruction, our position in the world, and the creation of conditions in which people can find security and satisfaction depend to a large degree on the energy devoted to research".

The new centers will be at Linden, N. J., and at Baton Rouge, La., at both of which places Standard Oil Development Company already has large laboratories. The expansion program ultimately may involve the expenditure of $8,000,000. At the outset eight buildings containing a total of 350,000 square feet of space will be erected there in a landscaped area of 60 acres near Park and Linden Avenues, and one building containing 35,000 square feet will be put up at Baton Rouge. Applications filed with the War Production Board for a major portion of the project have been approved. Construction work alone is expected to provide 1,800,000 man-hours of employment. Broken down into days, this will mean 225,000 eight-hour work days. Mr. Holman said the company had had plans and blueprints prepared and had set the start of work for the earliest possible moment in order to contribute to jobs during the reconversion period for men released from the services and war work.

To help staff the new facilities, an increase of at least 20 percent in the present research and technical group of 2,100 will be necessary. Adding to Mr. Holman's announcement, R. P. Russell, president of Standard Oil Development Company, said the new laboratories would be used not only for developing improved products from oil and processes for producing them but in addition extensive work on extending sources of supply of oil products would be carried out. This latter work will include production of liquid hydrocarbons from natural gas, gasification of coal, oil from coal and production of oil from other carbonaceous deposits such as oil shale.

Basic studies will also be conducted on the application of catalytic processes to derive chemical raw materials from petroleum. One section of the new structures will be devoted to research on extremely low-temperature polymerization, important in the field of new plastics. A process of this nature is the basis of Butyl rubber, a synthetic development by Jersey Standard and superior to natural rubber for inner tubes and for certain other purposes. Discovered prior to Pearl Harbor and perfected during the war, the entire output has gone to military needs.

In addition, Mr. Russell said the company will expand its investigations in various aspects of the science of physics. Having had a part in the earlier work on the atomic bomb, it plans to keep abreast of developments involving use of atomic energy.

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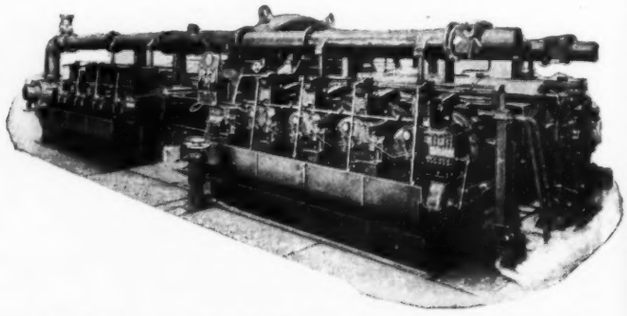

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P.61

### Houdry in Moscow

EUGENE J. HOUDRY, inventor of catalytic cracking and president of the Houdry Process Corporation, and Arthur V. Danner, executive vice president of the corporation, with several associates, have arrived in Moscow to discuss the operation of Houdry catalytic cracking facilities being installed in Russia. The trip is being made at the request of the Russian Government with the sanction of the U. S. Department of State.

In order to provide aviation gasoline facilities in the USSR, a special commission of Russian petroleum experts came to the United States in 1942. The Houdry process was selected by the commission and eight Houdry catalytic cracking units were ordered under lend lease arrangements with the United States. Construction of refining capacity of approximately 25,000 barrels per day is nearing completion. Mr. Houdry and his group plan to check on the efficient operation of these units and to conduct a general discussion of refining methods.

### Measuring Tulsa Industrially

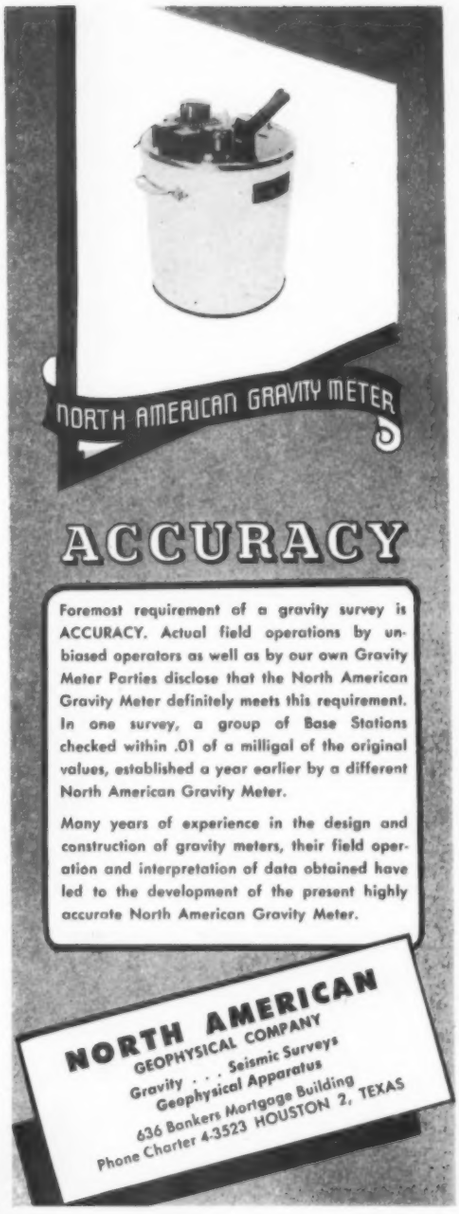
THIS is the title of a handsomely gotten-up brochure of twenty pages, published, by the Tulsa Chamber of Commerce with the intention of calling attention of industries seeking new locations to the advantages of the Oklahoman metropolis. To many people outside the Sooner state Tulsa is merely the "oil capital" of the United States; it is the oil capital all right but it is also located on top of huge oil reserves and within a few miles of important metal mining areas besides being in a thriving region of manufacturing and modern business enterprise. Before Pearl Harbor Tulsa had 1606 manufacturing plants listed by the census as producing annually a third of a billion dollars' worth of goods, including tools, aircraft, glass, textiles, glass, chemicals and of course all types of oil field equipment, and there seems to be room and opportunity for more. It is significantly added that Oklahomas's tax structure is more favorable to industry than that of any other of the 48 states.

### Mexicans to Visit UOP Laboratories

HYDROCARBON research and development laboratories of Universal Oil Products Co. at Riverside, near Chicago, will be visited in October by a group of Mexican leaders who will be delegates to the Mexican-American Conference on Industrial Research. The conference is sponsored by the Illinois Institute of Technology.

Dr. Gustav Egloff of Universal Oil Products Company, a member of the Technical Advisory Committee for the Conference, invited the Mexican industrialists to inspect the 27-acre UOP research plant. The Riverside institution includes chemical and physical laboratories and pilot plants as well as automotive engine laboratories for evaluation of automobile and aviation gasoline and diesel fuel.

***Fighting gasoline fires was one of the frequent experiences of Navy men during the Pacific war. This was particularly the case with the crews of plane carriers which were favorite targets of Japanese kamikaze (suicide) attacks. Over four million gallons of foam liquids were used by the Navy in overcoming such fires during the late Pacific campaign. The accompanying illustration shows the flight deck of the U. S. S. Enterprise during the critical stage of a conflagration caused by exploding shells. Photo courtesy National Foam System Inc.***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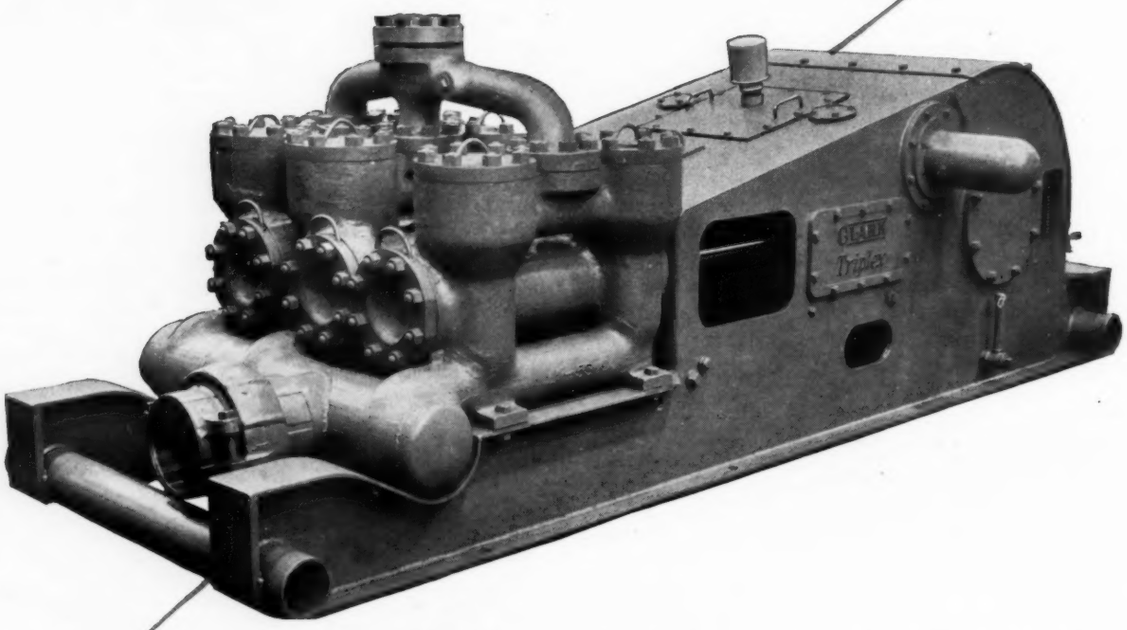


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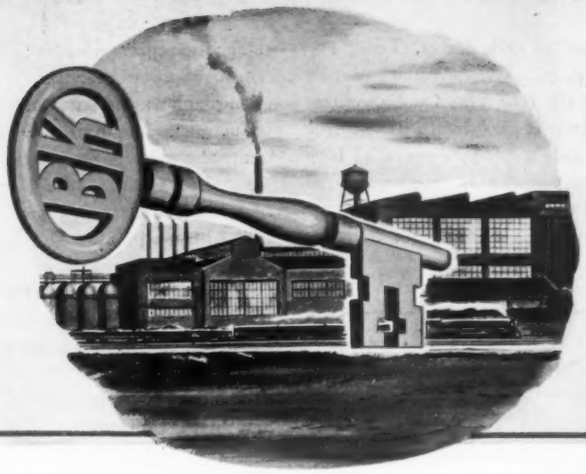
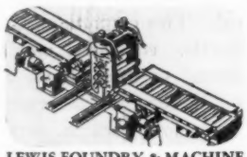


# The Key Called "KNOW-HOW!"



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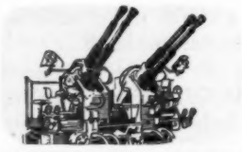
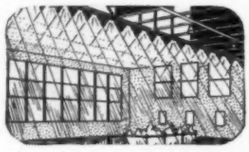


MARTINS FERRY and SPECIAL ORDNANCE DIVISIONS . . . 40 mm anti-aircraft gun mounts and mechanisms.



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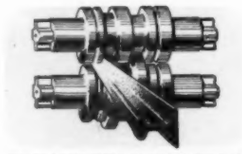

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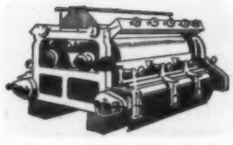

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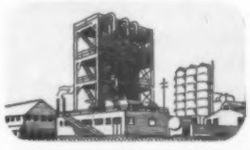

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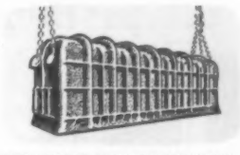

UNION STEEL CASTINGS DIVISION . . . Steel and alloy castings for steel mills and railroads. Gear blanks, pump casings and castings for general industrial usage.

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## Kellex Built Atomic Bomb Plant

SINCE the atomic bomb was made known to the world—and particularly to the Japanese—it has been revealed that a number of American manufacturers had a share in the production of this, the war's deadliest weapon. One of the most important participants, it is made known, was the Kellex Corporation, secret subsidiary of The M. W. Kellogg Company, which designed, engineered and supervised construction of one of the major plants at Oak Ridge, Tenn. and was associated with purchases involving a substantial portion of the two billion dollar outlay for the project. It was also disclosed that title to patents which are expected to prove of high industrial value in postwar application of the principles of the atomic bomb project, were assigned to the government by the Kellex Corporation.

There are three plants in the atomic bomb project at Oak Ridge: (a) thermal diffusion; (b) magnetic separation and (c) diffusion separation through porous barrier. The diffusion separation plant was designed and supervised in its construction by the Kellex Corporation which company also selected the site for the plant. The process of separating the isotopes involves many stages and these operations all are carried out in the diffusion plant.

In the early steps of its task the Kellex Corporation built a full-scale pilot plant on a site adjacent to the Kellogg Company's laboratories in Jersey City, N. J. This pilot plant was used to test instruments and mechanical operation of newly developed equipment.

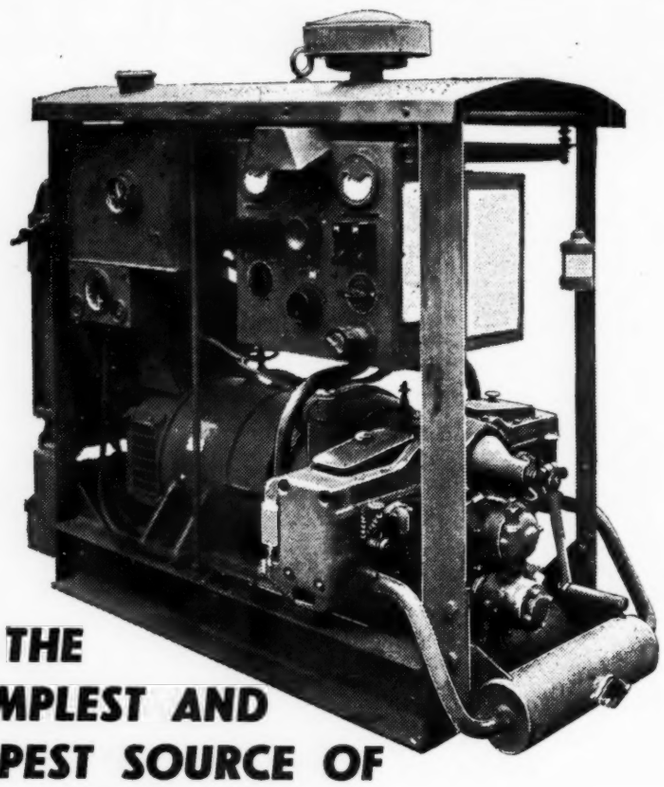
The identity of the Kellex Corporation is unusual. This corporation is in reality a group of scientists, engineers and administrative men gathered with engineers and other executives from Kellogg for the express purpose of doing organization, research, development, design, procurement, inspection and test work and supervision of construction of a plant for isotope separation of U-235. Uranium isotope U-235 is one of the major materials used in production of the atomic bomb.

The Kellex Corporation's operations were almost entirely of a pioneer nature. Virtually all the major equipment required for the plant at Oak Ridge was of a totally new concept. It made demands upon the company which were unparalleled in the history of American industry, requiring invention, research, completely new development of sources of supply, education of the supplying manufacturers and training of the employees of these latter companies.

As summarized by one executive of the Kellogg Company, "the task really involved the creation of a new industry". The problems set forth above were many times multiplied as they applied equally to every sub-division of the Kellex Corporation's work.

Invention played a major part in the task. Discussing this point a Kellogg spokesman said: "When we invented a special piece of equipment we could not find a company to produce it or none had suitable machinery so then we had to redesign the source company's factory and also redesign their equipment to enable them to make the products we needed. We encountered this problem frequently."

Under the contract terms all title to these patents reverts to the government. "We welcomed this provision as part of our contribution to this major factor in achieving victory over the enemy," the company official added. "We feel strongly that in view of the epoch-making significance of this development and its vast potential power for good or evil in the world—this provision in the contract was just and wise".

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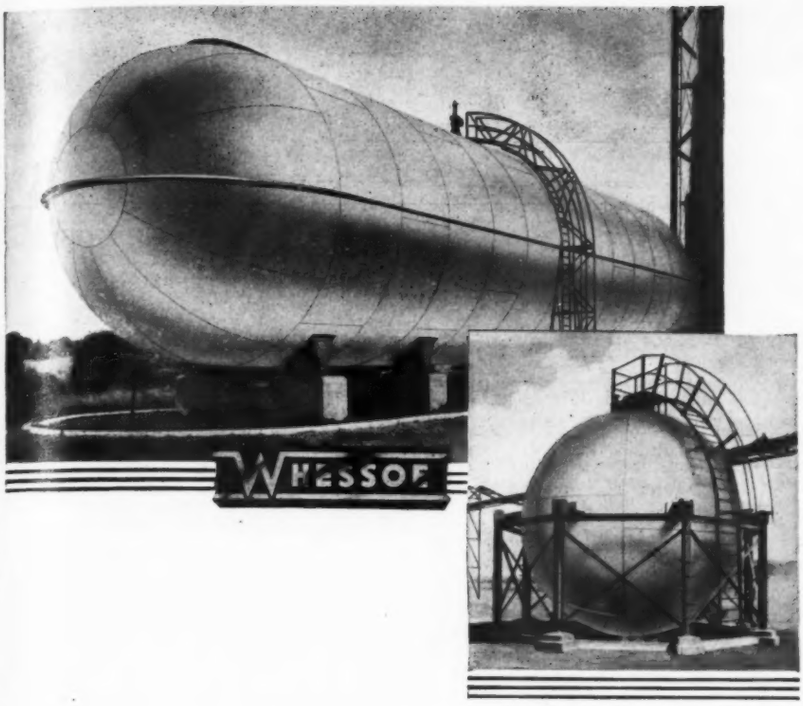


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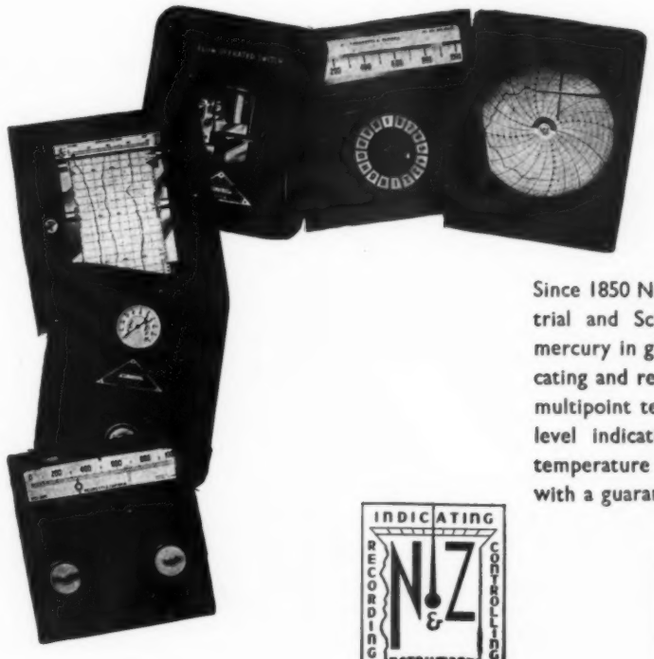

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ENGINEERING CONSTRUCTION DIVISION
17 BATTERY PLACE, NEW YORK


## Sinclair's Amination Process

SINCLAIR REFINING COMPANY has developed a new method for the production of organic nitrogen compounds by direct amination of olefins. For example, ethylene and propylene, available in refinery gas or derivable from propane, are reacted with ammonia to produce nitriles and amines. E. W. Isom, vice president directing the Research and Development Department, announces the process and cites United States patents numbered 2,381,470, 2,381,471, 2,381,472, 2,381,473 and 2,381,709 which issued on August 7.

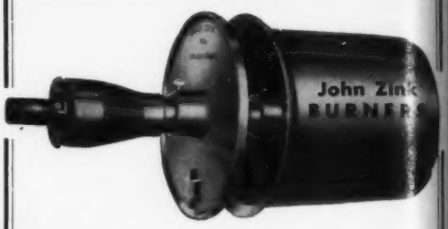
The new process accomplishes organic nitrogen fixation by a catalytic reaction with ammonia. Acetonitrile, propionitrile and butyronitrile are the primary products from ethylene and propylene. Pilot plant operation has established the production of these compounds and many derivatives as pure chemicals.

Acetonitrile, acrylonitrile and ethyl, isopropyl and normal butyl amines are examples of known industrial chemicals which can be manufactured economically by the new process. Acrylonitrile is produced now for polymerization with butadiene to yield oil resistant rubbers, the demand for which will increase significantly. Many new polymers and industrial syntheses are expected as soon as acrylonitrile can be produced more economically. Amines are required for rubber chemicals and other important syntheses, and a greater development is probable when this important class of organic bases are more extensively available.

Propionitrile, butyronitrile, normal propyl amines and isobutylamines potentially are new industrial chemicals. A market survey is now being conducted for Sinclair by Harshaw Chemical Company as distributing agents for information and samples. Numerous chemicals which have not been available previously for industrial use and many new derivatives hold great promise for future developments of pharmaceuticals, insecticides, fungicides, bactericides, solvents, intermediates for dyes, rubber, photography, and plasticizers and synthesis of new rubbers, resins and plastics.


**WANTED**

Sales executive experienced in automotive and industrial lubricants to direct activities of established national sales organization. Old, well known manufacturing company. References will not be contacted until after personal interview. Reply giving full details of experience to Box No. 1045, World Petroleum, 2 West 45th Street, New York 19, N. Y.

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